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An econometric analysis of the structure of the Greek economy and its development prospects

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An econometric analysis of the structure of the Greek economy and its development prospects

by

Efstathios Papageorgiou

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INTRODUCTION

The present study, based on the findings of an econometric model, is an attempt to formulate a policy of economic development for Greece. More precisely, given the existing structure of the Greek economy and assuming that economic growth is desirable, the investigation tries to determine those policies that would lead to that goal.

During the 1940-1950 period the productive capacity of Greece was completely destroyed, first as a result of foreign aggression and occupation, and second of civil war. With the termination of all hostilities in 1950, Greece faced a severely dislocated economy and rapid inflation. Restoration of the productive capacity could have eliminated inflation by increasing the level of output. The authorities would, however, have had to control effective demand by keeping the rise of private and public consumption considerably below the rate of growth of the level of output.

The attitude of the policy makers--particularly after 1950--was exactly the opposite; the Greek authorities were preoccupied with controlling inflation because "the Government felt that economic stability is to a large degree, a prerequisite to economic growth" (38; p. 43).

The economic policies implemented during the 1950-1956 period succeeded in gradually stabilizing prices while

permitting rapid income growth. But "this high rate of income growth should be attributed to the fact that in the early part of the period reconstruction (from the war) was still underway. Consequently there were many highly productive opportunities which could be exploited quickly. After 1957, the growth rate of national income slowed down somewhat, in spite of the great improvement in the overall climate for investment and production..." (38; p. 27). In addition, there was a deterioration in the balance of payments (BOP) and a rise in the level of unemployment.

Although economic activity picked up again between 1963 and 1966, the higher rates of growth of gross domestic product (GDP) recorded during this period did little to eliminate the deficit in the balance of payments or to increase the level of employment. By 1966 Greece was faced with a substantial external debt, and unemployment was kept low only through emigration.

Chapter I, in which a brief review of the economic history of Greece from 1953 to 1966 is presented, will attempt to show that the sectoral composition of GDP as it existed in 1960 will have to change considerably if the economy is to grow, and the deficit in the BOP to be eliminated.

The fact that a high rate of economic growth could coexist with unemployment, a deficit in the BOP, and an unfavorable productive structure, indicates that the Greek

government, during most of the period under discussion, was operating without any comprehensive economic plan. As early as 1946 some type of planning was done in Greece. A later plan, mainly a collection of investment projects, was prepared in 1953. None of these projects, however, were ever put into action and their bearing on the economic policies actually pursued by the government must be regarded as completely insignificant. The main reason for formulating these programs was to support the application for foreign economic aid, not to plan the economy.

By 1959 it became apparent that some form of planning must be introduced to help government agencies coordinate their efforts. The following year, 1960, a plan was proposed for the 1960-1964 period. The authorities were forced to formulate a program because of unfavorable trends emerging in the Greek economy, in particular widespread unemployment, a low degree of competitiveness of the economy, and the deterioration in the balance of payments. Although the 1960-1964 plan did specify for the first time main objectives for the public and private sector, it did not provide the means to attain these objectives.

In addition to these official plans, there were a number of studies dealing with specific economic issues. Chapter II reviews four quantitative studies of the Greek economy, each dealing with some aspect of the problem that Greece was

faced with. These studies are not policy models but descriptive models examining a) what the trade gap would be under certain conditions and b) what the productive structure would be if past trends are allowed to continue.

In Chapter III an econometric model is presented. Its basic feature is that both production equations and demand equations have been estimated and consistency is attained through the price equation and the balance of payments equilibrium condition.

The performance of the model over the sample period together with its predictive ability for two post-sample years are presented in Chapter IV. In addition, the estimated equations are assessed for possible adjustment taking into consideration developments after 1965.

In the first part of Chapter V, export forecasts for the 1969-1972 period are given. Forecasts for the rest of the exogeneous variables are also established. In the second part of the chapter the model is simulated by utilizing alternative combinations of the forecasted exogeneous variables.

Finally, in the Concluding Remarks, the projections of Chapter V are compared with the 1968-1972 official plan with respect to assumed overall rate of growth of GDP. Required foreign capital inflow and sectoral composition of GDP and their feasibility are also discussed.

CHAPTER I A REVIEW OF GREEK ECONOMIC DEVELOPMENT: 1953-1966

Introduction

Greece has achieved a high rate of economic growth in recent years. Between 1953 and 1966, GDP at factor cost (1958 prices) grew at an annual average rate of 5.60 percent. The population growth rate was less than one percent, implying an increase in the per capita income of about five percent per annum. The resulting increase in the per capita income (more than 200 percent) is in itself a strong indication that the economic policy in Greece has been rather successful.

It could be argued, nevertheless, that the growth rate in per capita income may not by itself be a sufficient indicator of the economic performance of a country. Information about income distribution, the level of employment, and the structure of production is also needed before one can evaluate the success or failure of the economic policies that were introduced in Greece during the 1953-1966 period. Unfortunately, some of the vital statistics necessary for making a thorough investigation of the performance of the Greek economy are not available; there are, for example, no comprehensive data on income distribution or employment.

The discussion in the section on The Input-Output

Structure of the Greek Economy of this chapter will be based on the 1960 input-output table (14) through which the degree and direction of sectoral interdependency of the Greek economy will be examined. The purpose of such an investigation is twofold: first, to see what the state of the productive structure was by 1960; second, to point out those sectors with the most important forward and backward linkages. The foundation of this analysis is an aggregate version of the original 50-by-50 input-output table (excluding the service sectors). Examining the productive structure of the Greek economy will lead the discussion to two additional topics: the pattern of sectoral allocation of investment, and the balance of payments.

An overview of the allocation of investment to the different sectors of the economy appears in the section on Investment.

The section on Employment presents a short discussion of employment trends. In the absence of reliable statistics one can only speculate about the level of unemployment.

Finally, The External Sector section examines the impact that the productive structure has had on the BOP. Greece has suffered a continuous deficit in the BOP which will be shown to be caused by both the inability of the agricultural and manufacturing sector to meet the needs of an increasing and changing domestic demand, and the need of imports for

industrial development.

Before proceeding with the discussion on the input-output table, the next section briefly reviews the major trends in the Greek economy during the 1953-1966 period.

The Overall Pattern of Growth

Greece's economic experience during 1953-1966 can be classified in three distinct subperiods (Table 1.1). The first subperiod, 1953-1957, is characterized by a high rate of growth, followed by a slowdown in the growth rate of GDP during the second subperiod, 1957-1962. Finally, from 1962 on Greece experienced an acceleration in the rate of growth. Similar trends may be observed in the growth rates of the agricultural and manufacturing sectors.

Economic growth during the 1950's was influenced primarily by the performance of the agricultural sector. In the period ending in 1957, agricultural output increased considerably in response to the rise in domestic demand for foodstuffs and favorable world market conditions for Greece's major exports, tobacco and raisins. The productive structure of this sector, nevertheless, was not geared for sustained growth since the main agricultural products continued to be subjected to low income and price elasticity of demand. After 1957 the rate of change of the output of the sector declined. As a result, the rate of growth of GDP during the

Table 1.1. Rate of growth of gross domestic product, agricultural and manufacturing sectors for 1953-1966 and three subperiods (in percentage of 1958 prices)

Period	Rate of growth of the manufacturing sector	Share of the manufacturing sector in gross domestic product (In %)	Rate of growth of the agricultural sector	Share of the agricultural sector in gross domestic product (In %)	Rate of growth of gross domestic product
1953-1966	7.75	16.6	3.05	27.0	5.60
1953-1957	9.30	15.0	4.65	30.4	5.80
1957-1962	6.40	17.0	1.40	27.0	4.70
1962-1966	9.60	18.0	4.30	23.5	7.40

1957-1962 period was significantly lower than that during the previous period.

Industrial output increased at a relatively high rate but its output during 1953 was low, and the high growth rates reflected less important absolute increases. While the output of the manufacturing sector was growing, industrial employment was virtually stagnant. Thus, "despite a 74.0 percent increase in manufacturing output during the 1953-1958 period industrial employment by 1958 was at the same level as that of 1952" (26; p. 22). After 1957 there was a slowdown in the rate of growth of the sector because of "... the limited ability of the Greek economy to expand owing to basic structural weaknesses which it has not yet been possible to eradicate" (38; p. 27). More precisely, the unsatisfactory performance of the industrial sector during the 1957-1962 period was caused primarily by a continuous decline in industrial capital expenditures, which started in 1954, although overall investment activity remained very high. Only in 1961 did the level of capital formation in that sector reach that of 1950. On the other hand, during the 1952-1957 period, investment in housing and transport communication increased by 76.0 percent.

Industrial production expanded very rapidly during the 1962-1966 period. A similar movement can be observed in the rate of growth of GDP while agricultural output increased at

a slower pace. The net effect of this process was that by 1966 the share of primary output in total GDP had declined while that of the manufacturing sector had increased, a change in the right direction.

Two questions, however, must be answered before it can be concluded that the changes in sectoral composition of GDP in the Greek economy during the 1953-1966 period were satisfactory. First, are the sectoral interdependency in general and the agricultural and industrial production pattern, in particular, such as to guarantee long run growth. Second, how close is the 1965 and the projected structure of output for 1972 to a desirable norm, which norm is taken to be Chenery's (2) coefficients of sectoral contribution, consistent with the size and per capita income of Greece. An attempt to answer the first question will be made in the next section through the discussion of input-output structure. The second question is dealt with in the next chapter, together with a review of the relevant study for Greece by A. Papandreou (21).

The Input-Output Structure of the Greek Economy

An examination of the input-output table of the Greek economy reveals certain links in the system and thus suggests a tentative pattern of resource allocation necessary to sustain a high rate of growth of GDP.

The degree and direction of interdependency of the Greek economy was first approximated by aggregating the 50-by-50 input-output matrix for 1960 to a 3-by-3 one. The aggregation was done so that agricultural and light industries sectors could be grouped together. Thus, sector A includes the agricultural (sectors 1-9 from the original input-output table) and the light industries, i.e., food processing (13-16), tobacco (11, 12), and textiles and clothing sectors (17-22). The second group, which may be labeled the industrial sector, consists of construction (42), metal processing (35), machinery (36-39, 41), transport equipment (40), electricity-gas-water sectors (43, 44), wood (23, 24) and printing (25, 26). Finally, the third, intermediate goods group consists of mining (10), construction materials (33, 34), and chemicals (23-32). (The service sector has not been included.)

One way to measure the interdependency of the three groups is by computing the ratios of the intergroup delivery (X_{ij}) to the total interindustry demand (X_i). Table 1.2 shows the above-mentioned ratios for the 3-by-3 matrix. Thus in group A, 91.23 percent of its interindustry deliveries are intraindustry transactions while only 2.06 percent and 0.86 percent of sector A's gross output are utilized by sectors B and C, respectively. The interdependency that Table 1.2 exhibits is such that the matrix is almost triangular

Table 1.2. Intergroup to total interindustry ratios[a,b]

	A	B	C
A	91.23	2.06	0.86
B	14.61	62.41	3.98
C	23.14	34.47	26.66

[a]Source: Derived from the input-output table (14).

[b]The sum of each row is less than one due to the fact that the service sector has not been included.

Table 1.3. The triangular form of matrix of Table 1.2[a]

	A	B	C
A	91.23		
B	14.61	62.41	
C	23.14	34.47	26.66

[a]Source: As in Table 1.2.

(with all elements above the main diagonal equal to zero) as represented in Table 1.3.

Table 1.3 implies that the output of group A is affected only by changes in its own structure or by variation in its own final demand. Such behavior is consistent with the

experience of most other countries. On the other hand, an important share of group B's interindustry deliveries is demanded by group A. Finally, group C has strong relationships with both A and B.

Next, the matrix of Table 1.3 is decomposed to a 6-by-6 one. Group A is split into agriculture, food processing, and tobacco (A_1); and textiles and clothing (A_2). The B group is also divided into two subgroups: printing, paper and wood furnitures (B_1); and metal processing, machinery, construction, and gas-electricity-water (B_2). Finally, group C_1 includes the chemical industries and petroleum refinery; and C_2 mining and construction materials.

Table 1.4 shows the relationship among these six sectors which have been determined in the same way as in Table 1.2.

Table 1.4 reinforces, up to a point, the tentative conclusions that were made on the basis of Table 1.2 since the quasi-triangular characteristics of the matrix are maintained.

In the agriculture-foodstuff (A_1) and textiles (A_2) subgroups, the intraindustry deliveries are still the most important ones. This is also true with respect to the energy-machinery group where the intraindustry delivery is more important than any other relationship. On the other hand, the paper-wood group (B_1) exhibits a stronger relationship with B_2 than with itself. In the intermediate group the

Table 1.4. Intergroup to total interindustry ratios[a]

	A_1	A_2	B_1	B_2	C_1	C_2
A_1	85.87	4.74	2.08	0.20	0.80	0.00
A_2	9.30	84.87	0.58	0.43	0.92	0.19
B_1	9.84	2.00	29.06	33.66	2.25	1.15
B_2	11.43	4.39	3.47	58.80	1.98	3.08
C_1	21.56	15.84	2.26	12.50	19.84	3.99
C_2	2.51	0.26	0.18	62.41	24.03	6.66

[a]Source: As in Table 1.2.

intraindustry deliveries on the chemical (C_1) are rather limited while those of mining-construction (C_2) are of importance. At the same time the relationship between the original C and B is caused primarily by the C_2 to B_2 and that between C and A by C_1 to A_1 only. The above description indicates not only that the enlarged matrix is almost triangular but also that some of the elements below the main diagonal can be considered as zero.

The agriculture-foodstuff group is probably the most important one in the Greek economy. The contribution of this group to total output is almost 25 percent while the food processing industries and tobacco amount to about 40

percent of the industrial output (both figures for 1966). Unfortunately, most of the sectors in this group are characterized by an inelastic price and income demand for their products. There are, nevertheless, two subgroups within A_1 that show strong growth potential. One is the livestock sector which is faced with increasing domestic demand; and the other is the vegetables-fruits and cotton sector with strong export potential. It has been estimated that the income elasticity for meat is 1.41. Thus, import substitution in this direction will not only accelerate the growth of group A_1 but, through its links with the rest of the groups, will promote further expansion.

The improvement of the structure of the agricultural sector will have some effect in groups B_1 (machinery) and C (chemical-fertilizers). Greek agriculture is characterized by a high degree of inefficiency, caused primarily by land fragmentation and dispersion. Any improvement in the consolidation of land would make the use of agricultural machinery feasible and expand the use of fertilizers. In addition to land consolidation, it will also be necessary to change the price support system. This is particularly important for grains. Changes in Group A_1 internal terms of trade in favor of livestock products, fruits, vegetables and cotton and at the expense of grains and traditional industrial exports will facilitate the needed import substitution

and export expansion. Import substitution, the growth of exports, and improvements in the structure of the agricultural sector will permit the economy to grow, but only for a short time. The agricultural potential of Greece is rather limited and after import substitution for livestock products is completed, there will be little to be done in this direction.

It becomes apparent then that it is necessary to change the interdependency that exists in the Greek economy. The machinery group (B_2) has very limited links with the other groups. In addition, the share of B_2's output to total output is very small. The same is true with B_1. It is, nevertheless, the growth of the machinery sector that could sustain an accelerated overall development. Three of the sectors in group B_2 (construction, machinery, and transport equipment) might be termed the investment sectors. The existing interdependency reflected by the input-output table implies that the increase in the production of group B_2 will be the result of both a supply expansion and a response to changes in the demand for investment goods. This is so because most of the output of the previously mentioned three sectors is considered as investment and is recorded on the final demand of this group. It would seem then that the expansion of the investment sector will very much depend on the rate of increase of capital expenditures. Furthermore,

the expansion of the machinery sector will have strong repercussions on the metal processing sector. This strong linkage between the machinery group (sectors 36, 37, 38, 39) and metal processing (sector 35) will result either in an increase in the imports of metals or in the domestic production of such products.

Present trends indicate that Greece is going to produce a large part of the iron and steel products it will use domestically around 1970-1972, while the present production rate will enable the country to export substantial amounts of aluminum. The major problem with the machinery-energy group is that the construction subsector is the primary consumer within the group, and any slowdown in such activity will have strong negative effects on the rest of the group. Although private investment in housing construction should be discouraged, and channeled instead to other industrial activities, the authorities are still (1968) promoting capital formation in dwellings as a means of accelerating growth. This is undoubtedly caused by the importance of the sector for short-run growth

and the high level of employment that it generates.

The chemical-fertilizer group is faced with promising prospects because of increasing demand for its products. Domestic demand for fertilizers is rising and if production costs can be lowered there is some potential for exports. At the same time, the continued growth of textile and clothing industries will exert pressures on the group through demand for synthetic material. Finally, further growth could come through import substitution in oil refining, oil by-products, rubber products, and other chemicals.

The picture that emerges from the previous discussion is that the input-output structure of the Greek economy, as it existed in 1960, would have to be altered in order to permit a continuous increase in the rate of growth of GDP. However, any change in the sectoral composition of GDP will imply a similar alteration in the structure of investment expenditures. The historical pattern of sectoral allocation of capital expenditures will be discussed in the next section.

Investment

The share of investment expenditures in GDP has shown a sharp rise during the last thirteen years. Thus, the investment GDP ratio rose from 14.0 percent in 1953 to approximately 26.0 percent in 1966 (Table 1.5).

Table 1.5. Rate of growth of capital expenditures and share to GDP for 1953-1966 period in percentage at 1958 prices

Period	Rate of growth of investment expenditures	Rate of growth of GDP	Share of investment to GDP
1953-1966	10.50	5.60	20.0
1953-1957	8.70	5.80	15.0
1957-1962	11.00	4.70	20.6
1962-1966	11.20	7.40	25.0

The growth rate of capital accumulation and the investment in GDP ratio were uneven over time. During the period 1953-1957, for example, the share remained at the same level (approximately 15.0 percent), while investment expenditures showed a drastic absolute decline in 1953 and 1954. The slow growth of capital accumulation during 1953-1957 may also be partly responsible for the poor performance of the economy during the next period 1957-1962. The investment activity improved considerably during 1957-1962 (despite a small decline in investment expenditures in 1959 and 1960) as did the GDP in 1962-1966.

While the rate of growth of investment has been fairly high during the period under discussion, its sectoral allocation has been uneven (see Table 1.6). The sectors that have

Table 1.6. Rate of growth and sectoral allocation of investment expenditures by sector (in percentage of 1958 prices)

	Rate of growth of investment in the agriculture sector	$\frac{I_A}{I}$ [a]	Rate of growth of investment in the manufacturing sector	$\frac{I_M}{I}$ [b]	Rate of growth of investment in the housing sector	$\frac{I_H}{I}$ [c]	Rate of growth of investment in the transportation sector	$\frac{I_T}{I}$ [d]
1953-1966	14.10	12.60	10.20	11.20	8.50	36.80	17.00	14.80
1953-1957	20.00	9.60	9.80	11.60	5.00	42.00	26.40	10.20
1957-1962	12.00	15.50	6.30	11.00	8.50	33.00	16.20	18.00
1962-1966	8.00	12.50	15.00	11.00	11.40	36.00	9.20	17.00

[a] I_A = Investment in the agricultural sector.

[b] I_M = Investment in the manufacturing sector.

[c] I_H = Investment in housing construction.

[d] I_T = Investment in transportation.

consistently absorbed over fifty percent of total investment have been housing construction and transportation. On the other hand, the industrial sector has been receiving only 11.0 percent of the total investment, while the agricultural sector's share has been fluctuating around an average of about 12.5 percent.

The preference for housing investment may be explained by the tendency of the average Greek to maintain control over his savings. The land fragmentation that prevails in the agricultural sector seems to be responsible for the small amount of capital expenditures allocated to that sector. Finally, despite the incentives that were introduced for the promotion of industrial capital, the manufacturing sector's share of total investment has remained at a very low level. In the next chapter an attempt will be made to examine those changes in the sectoral allocation of investment expenditures that would increase the share of manufacturing value added to total GDP.

Employment

The pattern of sectoral allocation of investment which was earlier considered and the resulting sectoral growth have also had strong repercussions on the level of employment. In general, the only sector that absorbed substantial manpower was the construction sector. Thus, the redirection of capital

expenditures away from construction of dwellings to other sectors, especially manufacturing, may have an undesirable impact not only on the GDP growth rate but also on employment. Since unemployment and underemployment seem to be very high in Greece, the short-run effects of such reorientation may be politically undesirable. On the other hand, a continuation of the present productive structure could lead to an eventual slowdown of economic growth.

The discussion of employment that follows is based on fragmented information since labor statistics in Greece are either nonexistent or unreliable. The available statistics on employment are: a) information from the employment office giving the number of individuals presently out of work and seeking employment. Statistics from this office do not seem to cover all of Greece, and, in addition, there is no reason to believe that all unemployed workers register with this office; b) statistics that are provided by the Social Insurance Foundation (I.K.A.). This office collects the social insurance contributions of the establishments that are insured with the public I.K.A., and some indications of emplomment can be derived from its receipts; and c) data collected by the National Statistical Office for a number of industrial firms.

An additional source of information for employment statistics is the external migration of Greek labor over the last twenty years. Emigration implies either lack of

employment opportunities within the country and or higher wages abroad. The high rate of emigration is a strong indication that employment opportunities have been limited in Greece. The consequences of the labor exodus together with a low natural population growth rate indicates that the demographic composition of Greece has been distorted, the trend being towards a nation of older people. The only gain from this process, and this is of short-run nature, has been the improvement of the BOP through emigrant remittances.

It is interesting to observe from the statistics of Table 1.7 that the number of registered unemployed during the 1962-1966 period did not change substantially, despite the fact that the GDP recorded its highest post-war rate of growth. At the same time the emigration rate for the 1963-1966 period was very high. Economic development in Greece was accomplished without providing the Greek people with a significant number of employment opportunities

In addition, Table 1.7 indicates that unemployment and emigration statistics tend to move in the opposite direction, which is consistent with what was already said, i.e., that unemployment was avoided through migration. Thus it is clear that the economic development pattern that the Greek economy experienced throughout the period under consideration left a large segment of the population unemployed or forced to migrate.

Table 1.7. Annual average numbers of unemployed as recorded by the employment office and annual number of emigrants: 1960-1966[a,b]

	Average no. of unemployed	Rate of change	Annual no. of emigrants	Rate of change
1960	86,968		47,768	
1961	76,001	-12.6	58.837	+23.2
1962	74,539	- 1.9	84,054	+42.8
1963	69,609	- 6.6	100,072	+19.0
1964	64,802	- 6.9	105.569	+ 5.0
1965	64,289	- 0.8	117,167	+11.0
1966	64,795	+ 0.8	86,896	-25.8

[a]Source: (31) pp. 46, 48.

[b]The year 1960 is the first year of massive emigration, particularly to Europe.

The External Sector

The balance of trade (BOT) in Greece has shown a consistent and sizeable deficit, financed either by foreign assistance or by the inflow of invisible receipts (Table 1.8). Prior to 1953 foreign aid was the most important source for covering the external gap. As a result of a substantial reduction in U.S. financial assistance in 1953, the

Table 1.8. Balance of payments of Greece 1950-1966[a] (in million U.S. dollars, in current prices)[b]

	Imports of goods	Exports of goods	Balance of trade	Net invisibles	Foreign aid	Net foreign capital inflow
1950	394.3	85.1	-309.2	30.4	294.2	5.3
1951	426.4	102.3	-324.1	37.0	292.0	5.3
1952	277.1	115.0	-162.1	48.8	126.7	6.8
1953	243.3	134.0	-109.2	84.4	66.2	14.8
1954	328.5	161.0	-167.5	94.1	58.2	31.0
1955	364.8	206.5	-158.3	117.8	60.7	34.4
1956	465.3	208.6	-255.7	143.2	70.5	44.5
1957	508.9	222.8	-286.1	186.0	23.1	66.0
1958	509.8	242.8	-267.0	169.0	23.1	68.5
1959	450.3	212.5	-237.8	182.3	41.1	69.1
1960	504.9	208.6	-296.3	207.7	42.6	47.2
1961	567.2	234.3	-332.9	243.5	37.6	90.2
1962	640.3	242.6	397.7	292.0	55.7	112.3
1963	731.6	295.9	435.7	355.3	42.9	105.2
1964	863.4	308.4	-550.0	350.2	37.9	173.2
1965	1016.5	330.9	-685.6	412.6	11.6	222.6
1966	1148.9	403.5	-745.4	481.3	2.7	262.8

[a]Source: (32).

[b]The exchange rate since 1953 has been 30 drachmas to the U.S. dollar.

Greek authorities were forced to restrict imports and finally to devalue the drachma by 50 percent. The initial impact of the 1953 devaluation was a short-lived improvement in the BOT. By 1956, the deficit in the BOT was again considerable and was caused by both a stagnation in exports and a high growth in imports.

The elimination of inflation in Greece and the continuous growth of income levels abroad permitted an increase in the inflow of invisible receipts and direct private capital into Greece. Serious problems in the BOP were avoided throughout the 1956-1966 period, solely because invisible receipts increased at a very high rate. Thus, if the existing structure of production is maintained, Greece's future growth will depend on how the invisible receipts perform.

At the present time it appears that foreign exchange earnings from tourism will continue to expand throughout the 1970's. The political developments of 1967, however, indicate how hazardous and vulnerable dependence on tourist receipts could be. Tourist receipts and emigrant remittances decreased by 11 and 1 percents in comparison to the 1966 level, respectively, a trend that continued through 1968, but was reversed in 1969.

Merchandise exports

The majority of Greek exports (over 70 percent) are agricultural. It is not surprising then to find that exports and primary productions have fluctuated the same way during the 1953-1966 period (Table 1.9).

The high rate of growth of merchandise exports experienced during the 1953-1957 period was the result, not only of expanding agricultural production, but was also helped by the 1953 devaluation and expanding incomes in Western Europe. The devaluation acted as a strong stimulus in promoting exports by improving the relative prices of certain Greek exports at the expense of other countries, such as Turkey. At the same time improvements in the standards of living in Europe and North America also had an impact on Greek exports.

Unfortunately, the structure of Greek exports was unfavorable for constant growth (see Table 1.10). The majority of these exports are characterized by low income elasticity of demand. Thus, while the effects of the 1953 devaluation wore off, the demand for the major exports was also becoming income inelastic. In addition, Turkey devalued its currency, thereby reversing the relative prices against Greece. The results was that during the 1957-1962 period, the growth in the volume of exports was only 4.7 percent per annum.

It is apparent from Table 1.10 that no essential changes have taken place in the export structure over the whole

Table 1.9. Rate of growth of merchandise exports and agricultural value added (in 1958 prices)

Period	Rate of growth of exports	Rate of growth of agricultural sector
1953-1966	7.30	3.05
1953-1957	8.50	4.65
1957-1962	4.70	1.40
1962-1966	9.20	4.30

period despite acceleration in the rate of growth during 1962-1966. As a result, tobacco and currants still dominate the picture. The only significant change has been the improvement of the share of cotton and, to a lesser extent, fruit and vegetables, which were responsible for the growth in the last period. The contribution of manufactured exports is still extremely low despite the substantial increase in their share during the 1964-1966 period.

Imports

The annual compound rate of growth of imports for the 1954-1966 period was 11.0 percent, while for the 1960-1966 period it reached 14.7 percent. Thus, as the rate of growth of GDP was accelerating in the sixties, so was the growth rate of imports. The parallel growth pattern of GDP and

Table 1.10. Percentage composition of exports of goods[a]

	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
Food-Beverages, including Raisin	29	23	22	28	32	30	27	26	29	24	26	31	33
Tobacco	38	38	31	39	38	33	35	35	28	43	38	34	30
Cotton	7	11	14	6	9	12	9	12	16	12	11	6	8
Raw Materials	8	7	10	8	7	9	11	11	9	8	8	9	8
Minerals	5	6	8	7	6	7	9	6	6	5	7	7	7
Manufactures	2	2	3	3	2	4	4	3	5	3	4	7	9
Rest	11	13	12	9	6	5	5	7	7	5	6	6	5

[a]Source: Up to 1963 (20), 1964 on (32).

imports is consistent with the experience of most developing countries. Economic growth causes, and, in turn, is sustained by the availability of imported goods for the following reasons:

a) industrial development depends on the availability of capital goods which have to be provided from foreign sources;

b) the improvement in disposable income generates demand for a variety of goods which may have to be imported (the existing income distribution in most developing countries, as well as in Greece, tends to stimulate the rise in the demand for imported consumer goods); and

c) the acceleration in economic activity is possible only if intermediate goods are available in increasing quantities.

The composition of imports has been changing throughout the period with the share of raw material and fuel declining in favor of capital goods and durable consumer goods. The resulting import structure (Table 1.11) by 1966 was, nevertheless, unsatisfactory since capital goods accounted for approximately one fourth of the total imports, while consumer durables were the largest item. The high share of consumer durables indicates that the process of import substitution has not gone very far. Industrial activity should be intensified in those sectors that could replace imports,

Table 1.11. Percentage composition of imports by group of products[a]

	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
Foodstuffs	18	24	29	20	16	16	19	18	14	19	17	19	18
Raw Materials	43	33	30	26	26	26	26	25	25	23	23	23	22
Petroleum Products	13	12	10	13	10	11	10	8	8	7	7	7	7
Capital Goods	15	11	11	11	18	18	16	18	22	19	22	23	23
Durable Consumer Goods	21	20	20	30	30	29	29	31	31	32	31	28	28

[a]Source: See Table 1.10.

since it will not only increase domestic production but will also help to reduce the deficit in the external accounts.

Invisible receipts

Despite the significant and growing gap in the balance of trade, Greece was able to avoid serious external problems because of a substantial growth in invisible earnings.

Invisible receipts have replaced exports as the primary source for import payment (Table 1.12). The composition of invisibles (Table 1.13) indicates that the bulk of the earnings is contributed by: tourism, emigrant remittances, and transport (shipping).

Tourism The growth of population and income in Western Europe and North America and the favorable conditions that exist in Greece have made tourism one of Greece's most profitable enterprises. Tourism has enabled Greece to accomplish, up to a certain point, two things: a) earning of valuable foreign exchange; and b) promotion of regional growth by opening new areas and employment opportunities.

The future growth of tourist receipts seems to depend on the ability of the authorities to meet the demand requirements. The traveling trend of the last years has been away from the centers of interest of the past and toward the periphery. In the case of Europe, the periphery is the Eastern Mediterranean. The rise in tourist earnings that

Table 1.12. Total exports and total invisibles in millions of dollars[a]

	1 Total Invisibles	2 Total Exports	Ratio 1/2 (in percentage)
1954	124.2	161.0	77.1
1955	153.8	206.5	74.5
1956	182.6	209.6	87.1
1957	235.7	222.8	105.8
1958	217.6	242.8	89.6
1959	237.2	212.5	111.6
1960	273.2	208.6	131.0
1961	319.6	234.3	136.4
1962	379.6	242.8	156.5
1963	454.3	295.9	153.5
1964	479.5	308.4	155.5
1965	549.4	330.9	166.0

[a]Source: (32).

Table 1.13. Composition of invisibles (in million dollars)

	Emigrants Remittances	Merchant Marine Remittances	Tourism	Rest
1954	47.0	28.1	25.3	23.8
1955	50.6	35.5	29.1	38.6
1956	60.9	48.3	31.2	42.2
1957	75.0	66.6	41.5	52.6
1958	76.7	60.3	36.2	44.4
1959	88.6	60.3	41.7	46.6
1960	92.7	76.5	49.3	54.7
1961	107.5	102.0	62.5	47.6
1962	139.1	108.7	76.0	55.8
1963	168.1	125.3	95.4	65.5
1964	176.8	147.2	90.0	64.6
1965	207.0	163.8	107.6	71.0

[a]Source: (32).

Spain and Yugoslavia have experienced in the last ten years indicates that Greece, which has the same climatic conditions as these two countries, would attract a large share of any further growth if the necessary measures were undertaken.

Meeting the demand requirements for tourist services is important so that no valuable exchange is lost. There are, nevertheless, objections if the supply of tourist services is to grow independently of the growth of other sectors. Tourism depends to a large extent on the output of a number of sectors of the economy and if there is no balanced growth between tourism and the rest of the economy, there may be a negative effect on the overall pattern of development.

Undesirable results of an unbalanced increase in the supply of tourist services may be caused by importing certain commodities to meet tourist demand that may upset the balance of payments. For this reason there should be a distinction between net tourist receipts vs. gross tourist receipts. Net tourist receipts are calculated by subtracting from gross earnings the exchange paid for importing certain commodities that were exclusively used for meeting tourists' needs. Due to the lack of relevant statistics, it is very difficult to estimate the net earnings in Greece over the period under consideration.

In addition, pressures to meet the demand for tourist

services may force the expansion of certain sectors and thus be contrary to the overall needs for economic development. In the past the necessity for creating attractive and accessible centers for tourists resulted in a number of tourist highways at the expense of other needed roads. Of course, if it is decided that tourism is the only hope for promoting economic growth, as G. Triantis (33) has attempted to show, then investing in tourist facilities at the expense of everything else is the logical conclusion. It would seem, nevertheless, a little dangerous to rely very heavily on tourism. Tourist receipts have been very sensitive to political developments not only in Greece but also in neighboring countries. Travelers tend to avoid areas of potential conflict. In the summer of 1967, due to the Israel-Arab conflict and the political developments in Greece, tourist receipts declined and there was not much that Greek authorities could do to improve the situation.

Shipping receipts The sources of shipping receipts are: a) sailors' remittances; b) shipowners' remittances; and c) receipts from ship repairs, etc.

Sailors' remittances have not increased as much as they might have because the majority of sailors prefer to deposit a large share of their income in foreign banks.

The extremely fast rate of growth in shipowners' remittances should be compared with the virtual stagnation,

since 1961, in the increase of ships under the Greek flag. This comparison forces one to conclude that the larger part of this type of invisible receipts is due to "nonshipping" investment or expenditures. In other words, prevailing economic conditions in Greece have encouraged Greek shipowners to invest in other activities. It is difficult to discover what sectors have attracted the majority of this capital inflow and, as a consequence, how profitable the investment has been. There seems to be, nevertheless, some indication that the largest part of shipowners' remittances has been invested in unproductive luxury housing construction. As a result, an attempt to discourage investment in housing may reduce shipowners' remittances.

The future trend of earnings from shipping will depend on the world growth of maritime transportation, the influence domestic economic conditions will have on the investment decision of the shipowners, and finally, the ability of the Greek government to attract under the Greek flag Greek-owned ships.

Emigrant remittances The primary points of destination of Greek emigrants during the past fifty years have been North America, Western Europe, and Australia.

Emigrant receipts from North America have been fairly steady and consist primarily of pensions that retired American citizens (of Greek origin) are receiving from the U.S.

government, while residing in Greece. The further increase of North America emigrant remittances will depend on rises in the U.S. Social Security payments and on the number of Greek-Americans who decide to spend their retirement years in Greece.

The high rate of growth of emigrant remittances from Western Europe is the result of the massive labor migration during the 1956-1965 period. Labor remittances from Europe slightly declined during 1966 as a result of the economic recession that Western Europe suffered at that time. The future growth of emigrant remittances from Western Europe and Australia will depend on the level of migration and the prevailing economic conditions in the foreign country and Greece. In any case, any further substantial labor migration from Greece will be harmful for the country because it will further distort the demographic distribution.

Foreign capital inflow

The net inflow of foreign capital reflects to a large degree domestic developments (see Table 1.14).[1]

The first observation is that private industrial capital has only been important since 1963. On the other hand,

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[1]The figures of Table 1.14 do not include private industrial capital that was imported in the form of machinery.

Table 1.14. Net foreign capital inflow 1954-1966[a] (in million dollars)

	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
Industrial capital	3.1	5.5	3.0	3.5	13.5	22.1	15.3	18.6	27.5	44.3	48.2	84.4	69.9
Nonindustrial capital	14.1	16.9	17.5	30.5	24.1	28.9	31.8	36.3	40.8	43.5	53.1	57.8	65.2
Banks and credit institutions	2.0	2.4	4.6	1.8	16.1	11.4	-0.6	3.4	7.6	9.0	8.6	4.7	13.6
Government and public institutions	6.0	--	--	--	--	15.4	15.1	34.7	15.6	1.6	47.5	55.3	89.9
Commercial credit	8.9	12.8	24.6	33.8	18.3	-4.5	7.8	6.0	31.8	23.2	32.1	37.8	45.4

[a]Source: (32).

nonindustrial private capital--90 percent of which was for real estate--has been substantial throughout the period. In other words, private foreign capital inflow followed the same pattern as investment expenditures, showing a strong preference for housing construction (as was already pointed out, most of the nonindustrial foreign capital was from Greeks living abroad). The second observation is that the public sector and public corporations have come increasingly to rely on external borrowing, particularly since 1964. Finally, commercial credit has been used lately and extensively to finance imports.

The resultant foreign indebtedness (see Table 1.15) has reached a very high level. In the next few years substantial amounts of foreign exchange will be required for interest and capital amortization payments. During 1960 approximately $9M were paid for interest and amortization payments compared with $39M during 1966 (see Table 1.16). The higher payments by the public sector do not imply that the private sector's terms of indebtedness are better. The main reason for the substantial difference is that most of the industrial private capital is subject to P.L. 2687/53 which permits a number of alternatives to the foreign investor as to how he is going to be repaid for his original capital and export his earnings. Since, as was already stated, private industrial capital has become important since 1963, one would anticipate that

Table 1.15. Foreign obligations of the Greek economy[a] (in million dollars)

	1960[b]	1961	1962	1963	1964	1965	1966		Change between 1966 and 1960
	1	2	3	4	5	6	7	8	8-1
Private enterprises	137.7	+26.7	+54.7	+66.1	+88.8	+153.9	+215.6	743.5	+605.8
Commercial banks	28.4	+ 3.2	+ 4.0	+ 1.2	+ 6.2	- 2.1	+ 7.5	48.4	+ 20.0
Public sector	101.2	+44.0	+ 0.9	- 2.9	+38.8	+52.1	+78.3	312.4	+211.2
Total	267.3	+73.9	+59.6	+64.4	+133.8	+203.9	+301.4	1104.3	+837.0

[a]Source: (32).

[b]End of the period.

Table 1.16. Interest and amortization payments in foreign exchange[a] (in million dollars)[b]

	1960	1961	1962	1963	1964	1965	1966
Private	1.5	4.1	2.1	5.3	7.6	10.0	13.4
Public	7.1	9.6	14.3	14.4	18.0	16.4	25.2
Total	8.6	13.7	16.4	19.7	25.6	27.6	38.6

[a]Source: (31), p. 154.

[b]The figures do not include payments on deposits made under P.L. 26871/53, the rest of the bank loans, commercial credit and credits by the European Payments Union.

capital outflow from the private sector would increase considerably in the next few years. A substantial rise in payments (from the public sector) is also anticipated because of the continuation of the policy of borrowing from abroad. The overall payment of interest, profits, and amortization is difficult to project but is bound to be considerable and to have an important impact on the BOP.

Concluding Remarks

The previous discussion indicates that the structural changes that took place in Greece during the 1953-1966 period

have not eliminated two undesirable features of the Greek economy, namely[1] unemployment and the deficit in the BOP. Because of the lack of relevant information very little was said about unemployment, but there is enough evidence to showshow that employment has not increased considerably, while emigration has. The deficit in the current accounts has been increasing steadily since 1953 and was at $264M in 1966. The deterioration in the BOP was caused by a continuous acceleration in the demand for imports while exports grew at a slower pace.

At the same time, the allocation of capital expenditures favored primarily the housing and transportation sectors which require the importation of capital goods and raw material but do not provide for exports. On the other hand, the two sectors (agricultural and manufacturing) that could generate exports received a small part of the total investment. The implication of such allocation of capital expenditures among the different productive sectors has been that the structure of agricultural and industrial output has not changed significantly over the period. At the same time, the explanation for the inability of the two sectors to attract significant capital resources lies primarily in

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[1]An additional question, that of income distribution, was not discussed because of lack of statistical information.

their existing structure of production.

The agricultural sector is characterized by land fragmentation and land dispersion. The small and dispersed farm does not enable the Greek farmer to utilize machinery and, as a result, capital intensive crops either are not introduced or, if they are, they are produced inefficiently. Moreover, whenever agricultural machinery is available it is underutilized.

The industrial sector is dominated by small and inefficient firms. Thus the majority of existing Greek industrial firms employ fewer than ten persons and are characterized by handicraft methods of production. In addition, the time trend indicates that the increase in the number of firms resulted from a rise in the number of small establishments rather than large establishments (see Table 1.17).

The explanation of this trend lies, partly, in the unwillingness of existing firms to expand if such growth implies going public. It has been argued that at this moment Greece has not reached that stage of economic development which will permit the creation of a strong capital market. Thus, according to G. Maniatis, "Rigidities (in Greece) of an organic, institutional technological and structural nature, as well as expediency, related to the demand for and the supply of equities, constitute serious barriers to the rapid development of the capital market" (17; p. 599).

Table 1.17. Number and percentage of industrial units by employment size[a]

Strata (by employment size)	1959		1963	
	Number	Percentage	Number	Percentage
1 - 10	100638	94.5	113617	95.0
10 - 20	3555	3.3	3309	2.7
20 - over	2296	2.2	2554	2.1

[a]Source: (6) p. 37.

This condition makes it apparent that the transformation process involving conversion of the savings, both of the small saver and of pension funds, into instruments of long-term debt and ownership should have been undertaken by specially created public or private institutions. The government efforts in this area have not been very successful if one judges from the results.

The failure to channel private savings to institutions that could finance industrial development, together with the presence of high import duties, permitted the survival of the marginal firms. In the absence of any strong policy measure, the small saver and the pension fund institutions invested their savings in the real estate sector.

The redistribution of capital expenditures from the housing sector to the industrial and agricultural sectors will require a more aggressive government policy and, if necessary, direct public investment to these sectors. This will demand more comprehensive development planning (than the 1968-1972 plan) which will not only establish some objectives but will give the authorities explicit means to attain those objectives.

CHAPTER II A REVIEW OF QUANTITATIVE STUDIES OF THE GREEK ECONOMY

Introduction

The main conclusions of the performance chapter were that the productive structure of the Greek economy needs a radical change and that the deficit in the balance of payments has been increasing at an alarming rate. The consequences of these two problems and their interrelationship were described under different headings. In this chapter the discussion continues but this time is based on the findings of quantitative research.

The aim of this chapter is then twofold. First, to see if on the basis of previous econometric studies one can support the conclusions of Chapter I and secondly, to examine if it is possible to improve the previous works in such a way as to incorporate all the important features of the Greek economy. The second objective is accomplished in Chapter III through the estimation of an econometric model.

The studies that are reviewed here were chosen because of their relevance to the present work. Two of them, that of Chenery and Adelman (3) and Michalopoulos (19), dealt explicitly with the trade gap and interestingly enough arrive at opposite conclusions. The theoretical objections to the method used, particularly by Chenery and Adelman (3)

are presented in Chapter III.

The third work is by Pavlopoulos (22) and deals partly with the sectoral problem by introducing explicitly sectoral submodels for the agriculture sector. The main interest in Pavlopoulos' work, however, is in the econometric techniques that are employed in formulating and testing the system.

The fourth study deals exclusively with sectoral growth. Starting from the assumption that there is a universally consistent sectoral pattern of development, A. Papandreou (21) attempts to discover two things. First, what is the deviation of the Greek sectoral growth from the universal norm in 1960, and secondly, what are the resource requirements in order to improve the productive structure in Greece by 1972. The same model is used in this chapter to update the findings for 1965 and then to project for 1972 with 1965 as base year. The results reinforce the conclusion of the previous chapter and make it mandatory that the model of the next chapter incorporates in an explicit way sectoral growth.

Chenery-Adelman: Econometric Model for Greece

The main purpose of the Chenery-Adelman (3) model was to examine the foreign capital requirements that will be needed by the Greek economy during the 1962-1972 period in order to attain a desirable rate of growth. In addition, an attempt was made to evaluate the productivity of foreign

aid in Greece during the 1950's.

The authors utilized a simplified version of the model that was used to study similar questions for Israel (4). There is, nevertheless, an important difference from the Israel model. In the study under review, the level of GDP becomes the main explanatory variable for the sixteen behavioral equations that were estimated in the model. To test the effectiveness of foreign aid in the past and the possibility for achieving self-sustaining growth in Greece by 1972, the original 28 equations model was reduced to two equations. The first equation gives the level of GDP as a function of imports. Imports in turn are estimated by the sum expected capital inflow and projected exports (F^m). Thus:

$$GDP_t^m = a + bF_t^m \quad . \tag{2.1}$$

Similarly the estimated investment from the system is assumed to be necessary to sustain the level of GDP_t^s and the relevant equation is:[1]

$$GDP_t^s = a_1 + b_1 F_t^s \quad . \tag{2.2}$$

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[1] Since the estimated model investment is not linked with capacity it was necessary to introduce a simple production of the form:

$$X_t = \frac{1}{k} I_t + X_{t-1}$$

where k is the incremental capital output ratio, I is gross investment, x is gross domestic product.

The F_t^s is determined by the difference in the level of domestic savings and the required level of investment. (The coefficients a, a_1, b, and b_1 in Equations 2.1 and 2.2 are determined from the estimated equations of the model.)

Equations 2.1 and 2.2 are thus used to estimate the GDP potential by assuming alternative levels of capital inflow. Since the authors assume that, $F_t^m \gtrless F_t^s$, it is apparent that one of the three following relationships will hold at any time:[1]

$$GDP_t^m \gtrless GDP_t^s \quad . \tag{2.3}$$

In other words if $GDP^m > GDP^s$, for a given F, this will imply that the savings-investment constraint is acting as a limit to growth.

What the study revealed was that at the early stages of development (1951-1957) foreign capital was needed to make up the gap between savings and investment. From 1957 on the export-import gap became the dominant one. Such a process is consistent with the experience of most of the developing countries. This trend can be explained in the following way: The rapid rise in the level of national income in the early years resulted in a) a substantial increase in the

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[1] In the next chapter a critical analysis of the two gap models will be presented.

level of domestic savings and b) in a high import requirement. Thus, while the savings-investment bottleneck was being eliminated by improvements in the level of income, the very same improvements caused the external constraint to act as a limit to growth.

Conclusions like the one mentioned in the preceding paragraph are relevant only under the assumption that growth is determined by the overall level of imports. More precisely, Chenery's analysis (2) seems to imply that there is a fixed relationship between imports and total expenditures. Thus, any change in the level of domestic expenditures will require (according to Equation 2.2) a change in the level of imports.

If the income identity is written in the form of Equation 2.4 the implications of the Chenery model could be seen:

$$X + M = C + I + E \quad . \tag{2.4}$$

In Equation 2.4, domestic product (X) and imports (M) denote the supply side while consumption (C), investment expenditures (I) and exports (E) represent the demand (Z). Ex post, Equation 2.4 is an identity, while ex ante it may be looked at as an equilibrium condition. Thus, if

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[1]For a thorough examination of the problem see (12).

$X + M \neq C + I + E$, a price change may be necessary to restore the equilibrium. As will be explained in the next chapter, one of the deficiencies of the two gap model is the exclusion of prices from the system.

The implications of Equation 2.4 will be examined by the use of a diagram. In Diagram 2.1, expenditures (Z) are shown along the horizontal axis while total supply is along the vertical. Starting from equilibrium, i.e., $X + M = I + C + E$ and since AB (= exports) on the horizontal axis is equal with AC on the vertical the CF then indicates the level of capital inflow that is required to balance the foreign transactions. The relations between expenditures (Z) and imports (M) is shown by:

$$\text{tang } a = \frac{M}{Z} \; ; \tag{2.5}$$

the $\frac{M}{Z}$ ratio will be called the import coefficient.

What Chenery and Adelman (3) imply is that the angle (a) is fixed in such a way that any change in Z will require a fixed change in M. While by definition the level of imports is determined by net capital inflow and exports, there is no reason to assume that an increase in total demand will automatically imply a specific increase in imports. Thus, if the demand rises to Ai (supply will have to increase to Bi in order to assure a rise stability) it may be possible (for imports) to stay at the same level as before. This

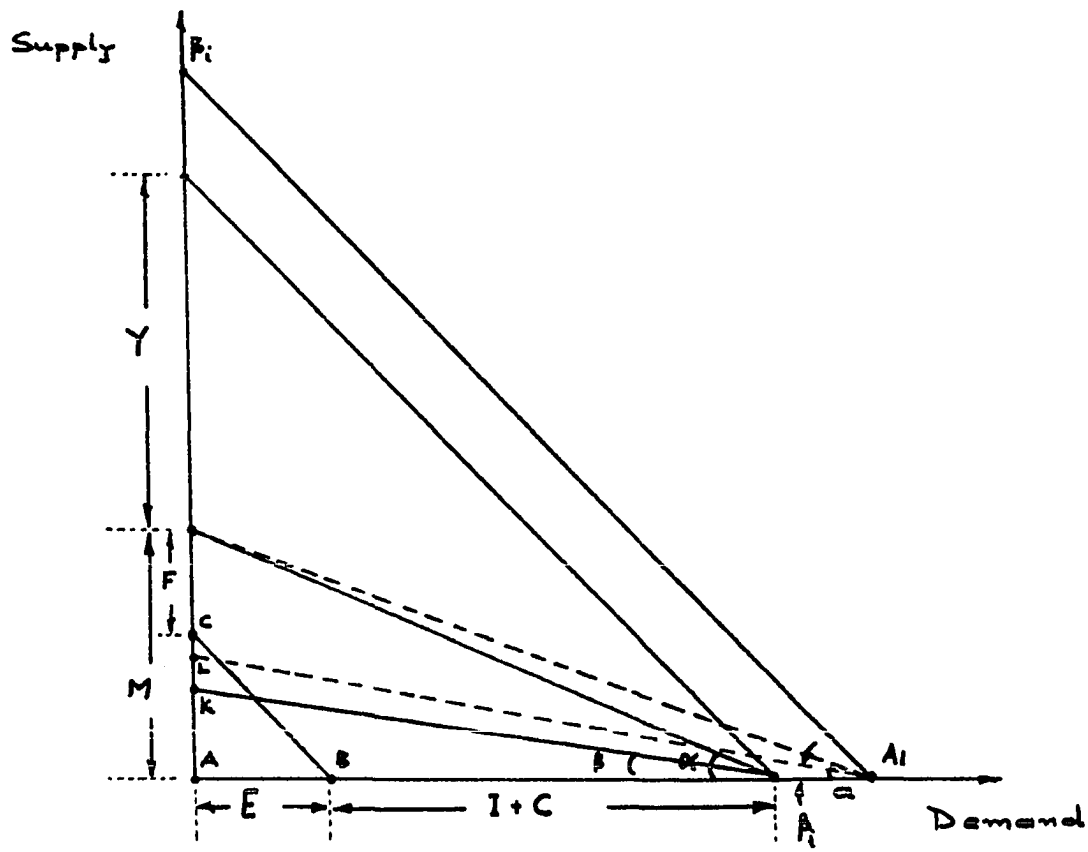

Diagram 2.1. The relationship between imports and total expenditures

could be accomplished by providing for all the additional demand through domestic production. Even if there is a fixed coefficient between domestic supply and imports of capital goods and raw materials (which is probably true for Greece) the authorities could divert expenditures from consumer imports to domestically produced ones to make room for the additional capital goods. The important relationship then would be not Z = f(M) as is represented by tang a but rather tang b which determines the required capital goods and raw materials for a given level of Z. When expenditures increase to Ai, tang a_1 > tang a but tang b = tang b_1. Under these circumstances imports of capital goods and raw materials will increase by KL at the expense of consumer imports. The major question is if it is possible to eliminate KL amount of consumer imports without generating inflationary pressures. In addition the change from imports to domestic production is a time consuming process, and for this reason in the short run the Chenery assumption will be valid.

The projections that were made by utilizing Equations 2.1 and 2.2 show that the trend that started in 1957 is intensified. By 1971 the F^m and F^s requirements (in 1954 prices) in order to sustain a six percent growth rate for the 1962-1971 period will be as follows: F^m = 33.7 bil drachma ($1.12 b), and F^s = -4.2 bil drachma ($140 m). In

other words while F^m will increase substantially over the 1962 figure, the value of F^s will be a negative one which implies that available savings will be in excess of possible investment. In order to utilize the potential savings and to reduce the level of F^m, the authors introduce an import substitution production function:[1]

$$M_{m_t} = \frac{1}{bk} \sum_{o}^{t-1} Im_t - aI_{m_t} \qquad (2.6)$$

where

M_{m_t} = reduction on import requirements

bk = capital output ratio required for replacing imports by domestic production ($b > 1$, and k is the actual capital output ratio)

Im = investment in import substitution activities,

a = the import content of Im.

Not only does Equation 2.6 permit the utilization of excess (potential) savings but furthermore, the import substitution continues up to the point where the two gaps (i.e., F^m and F^s) are equal ex ante. Utilizing Equation 2.6, Chenery and Adelman (3) found that by 1971, Greece will have a surplus in the Balance of Trade of 1.9 bil dr while the

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[1] Chenery and Strout (5) demonstrate these, p. 697-698.

surplus in the savings investment will be reduced to -1.9 bil dr.

The economic development of the 1961-1969 period has shown that some import substitution and export promotion has taken place while at the same time the F^m gap has increased to a dangerous level.

Thus, the conclusion of the Chenery-Adelman study that: "the tendency for the savings gap to decline, while the balance of payments gap rises, is a clear indication that new investment has not been sufficiently directed into sectors that earn or save foreign exchange" (3, p. 12), seems to be partly true. The deficit in the balance of payments has risen but at the same time industrial output and industrial exports have shown a remarkable growth (particularly after 1968). The Chenery-Adelman model does not separate required imports from overall imports. If this distinction was introduced into the model conclusions like the one just quoted could have been avoided.

Michalopoulos: Import, Foreign Exchange and Economic Development: The Greek Experience

The conclusions that were reached by the Chenery-Adelman study depend, as was already pointed out, on one or two crucial assumptions.

Michalopoulos utilizing a theoretical model that was

formulated by Ronald I. McKinnon (18) arrived at significant, different conclusions.

R. I. McKinnon's crucial assumption is the type of production function that is introduced in the model. Equation 2.7 is a Leontief type of production function implying a) that the factors of production are combined in fixed proportions and b) that there are constant returns to scale. For

$$P = \min(aK_d, \beta K_f, nM) \qquad (2.7)$$

the case under investigation, Equation 2.7 implies that there is no substitution among the three factors of production: capital imports (K_f), domestic capital goods (K_d), and imported intermediate goods (M). Thus, the shortage of any one of K_f, K_d and M will result in a constraint to growth.

In general, it seems that in the "medium-run" most of the developing economies are faced with nonsubstitutionability between domestic and foreign capital goods. Furthermore, raw materials may by necessity have to be imported no matter how flexible the capital sector is. An important characteristic of M is that one can also include consumer imports that amount to a certain percentage of domestic needs.

Ronald McKinnon (18) formulates the problem in such a way as to make the level of domestic savings and foreign capital inflow the essential factors of production. The

first because it finances domestic capital goods and the second because it a) permits the import of foreign capital goods and raw material and b) supplements domestic savings whenever this is necessary.

In order to determine the growth rate of the system the following relations are also introduced:

$$\max S = s'Y \quad . \tag{2.8}$$

Equation 2.8 presupposes the existence of a fixed maximum average propensity to save (s') out of net domestic income (Y). Since out of domestic output (P) only (1-1/n)P is net of foreign materials, the relationship between the average propensity to save out of P and that of Y is:

$$s = s'(1-1/n) \quad . \tag{2.9}$$

In addition, the change in output capacity, $\frac{dP}{dt}$, is assumed to depend on the level of net investment (I). By the nature of Equation 2.7, one unit of capacity, P, needs $\frac{1}{a}$ units of K_d and $\frac{1}{\beta}$ units of domestic output for new investment. The output-capital ratio is then:

$$\sigma = \frac{1}{\frac{1}{a} + \frac{1}{\beta}} \tag{2.10}$$

(clearly as $\beta \to \infty$ $\sigma \to a$ and this is the conventional capital-output ratio of the Harrod-Domar model)

$$\frac{dP}{dt} = \frac{1}{\frac{1}{a} + \frac{1}{\beta}} I \qquad (2.11)$$

since

$$I = s'Y = s'(1-1/n)P = sP \qquad (2.12)$$

Equation 2.11 becomes:

$$\frac{dP}{dt} = \sigma sP \quad . \qquad (2.13)$$

Solving Equation 1.13:

$$P = P_o e^{\sigma st} \quad . \qquad (2.14)$$

The implicit assumption that the time path of Equation 2.14 holds is that foreign exchange is available to meet the M and K_f requirements. Assume that:

$$\max E = \varepsilon P \qquad (2.15)$$

where E = exports and ε is the export to total output ratio.

The first requirement for Equation 2.14 to hold is that:

$$\varepsilon > \frac{1}{n} \qquad (2.16)$$

If Equation 2.16 does not hold, the system cannot operate unless foreign assistance is forthcoming. On the other hand, if Equation 2.16 holds, the remaining exports ε' from Equation 2.17 could be utilized to obtain foreign capital

$$\varepsilon' = \varepsilon - \frac{1}{n} \tag{2.17}$$

goods. Thus, a bottleneck can be avoided only if the required foreign investment (I_f^P) is:

$$I_f^P < \varepsilon' P \quad . \tag{2.18}$$

From Equation 2.7, the required I_f to maintain a growth rate of σs is:

$$I_f^R = \frac{1}{b} \dot{P} = \frac{1}{\beta} \sigma s P_o e^{s\sigma t} = \frac{\sigma s}{\beta} P_t \quad . \tag{2.19}$$

The I_f that is allowed on the other hand is given by inequality 2.18. If:

$$I_g^P < I_f^R \tag{2.20}$$

then:

$$\varepsilon' P < sP \tag{2.21}$$

or

$$\varepsilon' b < \sigma s \tag{2.22}$$

Relation 2.22 states that if I_f's rate of growth ($\varepsilon' b$) is less than P's rate of growth (σs). Since there is no substitution in the system, the rate of growth is now determined by that of I_f:

$$\frac{1}{b} \dot{P} = I_f = \varepsilon' P \tag{2.23}$$

or

$$P = P_o e^{\beta \varepsilon' t} \quad . \tag{2.24}$$

Michalopoulos calculated the following parameters:

σ = an average of the incremental gross investment to value added ratio.

s' = the foreign capital requirements of one unit of domestic output was estimated from

$$\beta = \frac{\sigma}{Im} \tag{2.25}$$

where Im is the import component of investment.

The period from 1952 to 1962 was divided into three subperiods: 1952-1954, 1955-1958 and 1959-1962 and the parameters σ, s, and β are averages of each period. There is no explanation in (17) as to why the period was broken down as it was and, at the same time, there is no indication if an attempt was made to investigate if the choice of the subperiods introduces any bias in the results.

Of course one of the drawbacks is how one calculates σ. H. Leibenstein (16) indicated that there is strong evidence that σ is a function of the rate of growth (r) rather than vice versa. Since the rate of growth is among other things influenced by the available resources, it is very questionable if r, estimated with the help of σ, should be used to calculate the level of the resources needed. Such an

objection also holds true for the Chenery-Adelman study (3) since σ was used there to determine the r.

The process by which the presence of a bottleneck is determined is the following.

Total exports of goods and services (E) are determined. From this figure, the necessary imports (M) are subtracted. Necessary imports are defined as raw material and imported consumer goods that account for at least 80 percent of domestic demand.

The foreign exchange available for I_f^P is then:

$$I_f^P = E - M \quad . \tag{2.26}$$

On the other hand, the required imports consistent with the given s and σ are determined by Equation 2.19.

$$I_f^R = \frac{s \sigma Y}{\beta} \quad .$$

If $I_f^R < I_f^P$ there is a bottleneck operating, and the system can grow to the extent that I_f^P from Equation 2.26 will permit.

Michalopoulos discovered that during the first two periods (see Table 2.1) and the overall period the required capital imports were substantially higher than those available--a fact that contradicts the Chenery-Adelman results.

The reasons for such a significant difference between

Table 2.1. Import and savings constraints in the Greek economy[a] (in millions of drachmas 1954 prices)

	1952-53 Average	1955-58 Average	1959-62 Average	1952-62 Average
Critical value of exchange needed (I_f^R)	1247	2231	3295	2343
Exports (E)	5241	6446	7125	6364
Invisibles (D)	1499	3209	7330	4241
Nonsubstitutables current imports (M_m)	5695	8280	11062	8587
Foreign exchange availability ($E+D-M_m$)	1045	1375	3393	2018

[a]Source: (18; table 2; p. 305).

the two studies is that a) Michalopoulos assumes imports to have an impact on the growth rate to the extent that they could be considered nonsubstitutionable and b) Chenery includes foreign aid as part of the sources available to finance imports.

Pavlopoulos' Econometric Study of the Greek Economy (20)

Pavlopoulos' book is a good example of how to use econometric methods for building and then testing economic models.

Chapters 2 and 3 deal with postulating and estimating

the equations of the model while in Chapter 4 the reduced form of the system is derived. Chapter 5 examines the performance of the model inside and outside the sample period and, in addition, simpler methods of forecasting are utilized and their results are compared with that of the formal model (the idea being to find out if the cost of constructing an econometric model is consistent with superior forecasting results when they are compared with less costly methods). In Chapter 6, the reduced form errors are analyzed. The important finding of this chapter is that a good fit in individual equations does not necessarily imply a satisfactory system of equations. The dynamic structure of the model is analyzed in Chapter 7 and certain policy questions are examined. It is only in the last chapter that some discussion on growth rate takes place.

In formulating the model, Pavlopoulos has, as is usually the case, started from the basic expenditure identity:

$$X = C + I + E - M \qquad (2.27)$$

where

X = Gross National Product

C = Consumption Expenditures

I = Investment Expenditure

E = Exports of Goods and Services

M = Imports of Goods and Services.

Private consumption is explained by income distribution and lagged consumption, the theoretical justification being that of Friedman's permanent hypothesis. The income distribution is given in the form of agriculture and nonagriculture income and, although such a breakdown reflects the economic realities of Greece, it has a major drawback in that is not available in disposable form. Pavlopoulos' contention that direct taxes and government transfers are almost equal and affect mainly the nonagriculture income is true to a certain extent. The introduction of the agriculture pension fund[1] that is financed mainly from nonagriculture sources affects disposable income. Furthermore, the use of the two forms of income does not permit the introduction of government transfers and direct taxes as an integral part of the model.

Private investment is broken down into two parts: a) the investment in housing construction; and b) the rest of private investment.

Investment in dwellings is explained by a rather questionable equation which has as explanatory variables a marriage index and moving averages of lagged disposable income. Population played an important role in the demand for housing but not in the way that Pavlopoulos assumes. It was a

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[1] 1961 after Pavlopoulos study was completed.

redistribution of the population from the countryside (also from abroad, mainly Turkey, Egypt) to Athens and to a certain extent Salonica that created both the supply (by financing construction) and the demand.

Given these considerations and, in addition, the lack of a capital market, investment in housing became a very desirable enterprise. Thus, a profit index such as the ratio of the interest rate to the construction cost or rent could be one of the relevant explanatory variables for investment in dwellings. For population, the relevant variable would be an index of the rate of increase of the population in the Greater Athens area. The equation that is introduced by Pavlopoulos is quite inappropriate. It would have been better to leave I_d exogenous.

For the rest of private investment (I_p^o), the estimated equation is consistent with Duesenberry's hypothesis that profits are assumed to depend positively on national income and negatively on the stock of capital. Thus, I_p^o is explained by profits (using national income as proxy) and capital stock since present capital formation competes in a negative way with past capital accumulation.[1]

But as Pavlopoulos admits, "it is unfortunate that in

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[1]Lack of capital stock figures forced Pavlopoulos to introduce the accumulated figure of gross private investment.

contrast to consumption theory, current investment theory is relatively unsatisfactory" (20, p. 60). This is true in a developing economy where the process of capital formation is more erratic because noneconomic considerations play a very important role in determining the level of investment. Thus, in a country the size of Greece it may not be very difficult to forecast investment since capital expenditures in a few major projects will account for the largest part of I.

Imports were explained by an aggregate function. National income and lagged foreign earnings are the explanatory variables. Since the estimated coefficient of national income is very small, the influence of the rest of the system on imports is rather limited. Pavlopoulos rejected disaggregated import functions because their ability to project was inferior to that of the aggregate function. The test nevertheless took place independently of the overall system so it is not clear how the disaggregated equations would have performed within the system.

For a more careful examination of the agriculture sector, both the supply and the demand of the sector have been introduced in the model. Whenever gross output and demand by sectors are incorporated into an econometric model, the problem arises of how to relate the two. One way is to relate supply and demand through input-output relation.

Pavlopoulos starts with the following equation:

$$S^A = St^A + D^A + X^A \tag{2.28}$$

but since D^A is not available he actually starts with:

$$D^A = S^A - St^A - X^A \tag{2.29}$$

where

D^A = Domestic demand for domestically produced agricultural products.

S^A = Gross agricultural product.

St^A = Change in stocks of agricultural products.

X^A = Exports of agricultural products.

If S^A is gross output, that is if:

$$S^A = \sum_j X_{ij} + D^A + St^A + X^A \tag{2.30}$$

Then Pavlopoulos has forgotten the $\sum_j X_{ij}$ term. If on the other hand, S^A is what it is suspected to be, i.e., value added, Equation 2.29 is wrong since on the sectoral level value added and final demand need not be equal. Pavlopoulos has formed the equality by estimating D^A as a residual. Thus, the model is somehow misspecified.

The main defects of the econometric model are: its aggregation, the limited role that is played by the government sector in determining the variables of the system, and

the weak link between imports and the other variables.

In Chapters 4 and 5 the reduced form and the performance of the model are investigated. The discussion on the derivation of the reduced form and its meaning is presented in addition to a comparison of the derived multipliers with those of other countries.

The performance of the model was examined by three alternative methods. The main criterion for distinguishing the three procedures was the degree of information that was required. The first method demands that both the values of the endogenous and exogenous variables that enter as explanatory variables be known. This method is indeed the simplest one and is only relevant for examining individual equations.

The second procedure only requires knowledge of the exogenous and lagged endogenous variables. Thus, it is necessary to solve first for the reduced form and the for the endogenous variables.

Finally, the third method is relevant for projection since the only variables that are needed are the exogenous variables and the initial values of the lagged endogenous.

The overall performance was satisfactory although for a number of variables the mean absolute percentage error, i.e.:

$$\left(\frac{Y_j - \hat{Y}_i}{Y_j}\right) 100 \qquad (2.31)$$

where

Y_j = observed value

$\hat{Y}_i$ = predicted value

was more than 3 percent. The investigation into the source of errors showed that "therefore one cannot have great hopes for major improvement in the performance of the model by seeking to improve the explanatory effectiveness of one structural relation along" (22; p. 185). It seems that the errors of individual equations are compounded instead of offsetting each other.

The next step is to evaluate the model by comparing its performance to four alternative naive models.

a. For each endogenous variable y_t · $y_t = y_{t-1}$

b. $\Delta y_t = \Delta y_{t-1}$

c. $\Delta y_t = p\Delta y_{t-1}$ The current change of an economic variable is assumed to be p proportional to the last year's change.

d. $y_t = gy_{t-1}$ This model assumed an equal percentage change.

The results produced by the four naive models were consistently inferior to that of the econometric model. Pavlopoulos concludes, and rightly so, that although the overall performance of the system is not very satisfactory, it has to

be accepted as a "working hypothesis" since the alternative methods of prediction performed very poorly.

He then proceeds to examine the sources of the reduced form errors. The reduced form of a system of simultaneous equations is:

$$Y = -B^{-1} \hat{\Gamma} Z - B^{-1} A - B^{-1} V_s \qquad (2.32)$$

where

Y is the vector of the endogenous variables

Z is the vector of the exogenous variables

B^{-1}, Γ, A, the estimated coefficients presented here as matrices of appropriate size.

Finally, V_s is the error vector of the estimated equations. Equation 2.32 indicates that for each endogenous variable its error is the sum total of error contributions of all structural equations. The error can be measured by the (var $V_{(u)}$) which is the sum of variances and covariances of all the structural residuals multiplied by the corresponding reduced form coefficients.

The conclusions that are drawn from this test are that in the model most of the equations participate in such a way as to build up the error of the system. At the same time, it was observed that the structural errors (i.e., of individual equations) are not necessarily responsible for the overall error since the weight that is attributed to these

(structural errors) may be small and thus offset them.

The second conclusion is a very general one and deals with the methods that should be employed in determining a system of equations.

The purpose of estimating a model is not, of course, to examine how a single endogenous variable behaves but how the overall economy is working. The implication of this observation is that methods that emphasize simultaneous estimation of equations are to be preferred over the commonly used single equation method.

The normally used two-stage least square procedure in estimating a system of linear equations is employed (most of the time) after individual equations have been evaluated. In other words, the structure of the system is determined by single equation methods and then a linear equation method is employed, to improve the econometric results.

In Chapter 7, the dynamic multipliers and the stability of the system is presented along the lines of A. S. Goldberger's analysis of "Impact multipliers and dynamic properties of the Klein-Goldberger model" (9).

Finally, in Chapter 8, the model is used to answer policy questions, primarily to forecast the total rate of growth of the Gross National Income. This is accomplished by utilizing past trends for the exogenous variables. The resultant growth rates are not very close to the observed

Table 2.2. Predicted and observed growth rates of GNP for 1962-1969 period[a]

	A Pavlopoulos	B Observed
1962	4.5	2.5
1963	6.8	7.2
1964	3.3	7.9
1965	9.5	6.8
Av. 1962-1965	6.0	6.1
1966	4.13	7.3
1967	6.63	4.5
1968	3.16	4.5
1969	9.3	8.3
Av. 1966-1969	5.8	6.2

[a]Source: (22) from column A, p. 306.

ones. (Table 2.2 presents Pavlopoulos' estimates and the actual one.)

As the author himself states, "we extended the calculations as far as 1969 although interest is mainly concentrated on the first four year period" (22, p. 307). This is, of course, due to the fact that in a growing economy, the structure tends to change very rapidly making a model irrelevant for the long run. The political change of 1967

introduced new parameters into the system that could not have been foreseen by Pavlopoulos. On the other hand, for the immediate period of 1962-1965, the model failed to project with reasonable accuracy the growth rates. The cyclical fluctuations in the rate of growth may be the result of the importance that the agricultural sector had in the model. At the same time, the very casual way that the exogenous variables (particularly exports of goods and services) were projected should also be considered as a serious contributor to the failure of the system to project a reasonable growth rate.

A. Papandreou: A Strategy for Greek Economic Development (21)

The aim of the Papandreou study was to design a simple and generally applicable procedure for investigating growth alternatives (that an economy is faced with) and to provide criteria for choosing among these alternatives and specifically apply them to the Greek economy.

Papandreou at first observes that a number of researchers have independently come to the conclusion that there is a strong international uniformity in the sectoral pattern of growth. He then proceeds first assuming a certain acceptable per capita income, to establish a sectoral contribution to the value added which he calls "standard" structure.

The standard structure may, or rather should, be altered to take into consideration both the historical developments in the economy and the direction where comparative advantage may best be sought. In this respect, alternative desirable structures may be introduced within which policy programs may be worked out.

A careful examination of the procedure will indicate that a certain optimization is introduced in such a method.

From the Harrod-Domar model it is known that

$$r = sK \tag{2.33}$$

where

r = the rate of growth

s = savings to income ratio

K = output-capital ratio.

The k is a weighted average of the sectoral k_j ratios

$$k = \sum_j w_j k_j \tag{2.34}$$

where

$$w_j = \frac{I_j}{I}$$

i.e., the sectoral allocation of investment (I).[1] Thus, by allocating I to the sectors with the highest K_j, the

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[1]For a proof, see O. Lange's article (15).

overall value of K is maximized (provided that certain minimum requirements for sectoral production are kept in mind). By maximizing K the rate of growth (r) assumed an optimum value or as high a value as s will permit.

The overall approach of course has its problems. The particular limitation of this framework is that intersectoral consistency is not investigated (Papandreou cautions strongly that there is no way to examine the overall consistency of the model without employing an input-output table).

Part b) of the original question is examined by utilizing Chenery's "Patterns of Indistrial Growth" (2). In what follows, the Papandreou results and the ones calculated here will be presented and compared. The purpose of the above Chenery paper is to explain the growth of the individual sectors (of production) by incorporating changes in the condition of demand and supply. He assumes that a degree of uniformity exists in the growth pattern of the different sectors in all countries and that this degree of uniformity is caused by what Chenery calls "universal factors" (as distinct from what he calls particular factors). Among the universal factors are: "(1) common technological knowledge; (2) similar human wants; (3) access to the same market for import and exports; (4) the accumulation of capital as the level of income increases..." (2, p. 626).

Chenery derives from a general equilibrium model a "sector growth function" (2, Equation 11b, p. 629) with the factors of production, per capita income and the level of population as the main explanatory variables. However, the statistical analysis is based on a function in which the independent variables are only the per capita income and the level of population.

The equation used is

$$\log V_i = \log b_{io} + b_{i1} \log Y + b_{i2} \log N \qquad (2.35)$$

where V_i is the per capita value added of sector i, Y is the per capita income and N the population level. The b_{i1} coefficient is a growth elasticity

$$\left(\frac{dV_i}{V_i} \Big/ \frac{dY}{Y}\right)$$

while b is size elasticity

$$\left(\frac{dV_i}{V_i} \Big/ \frac{dN}{N}\right)$$

for sector i.

Chenery estimates the b_{ij} by making use of cross section data from 51 countries (Table 2.3).

The coefficients of Table 2.3 will be used to examine the desirable changes in the output structure of the Greek economy.

Table 2.3. Coefficients of income and size[a]

Sector	b_{io}[b]	b_{i1}	b_{i2}
Agriculture	36.98	.474	-.082[c]
Mining	1.79	.935	.129
Manufacturing	11.92	1.441	.199
Construction	4.06	1.152	-.055[c]
Trans. and Comm.	4.64	1.288	-.048[c]
Services	32.70	1.066	.014

[a]Source: (2; p. 634).

[b]b_{io} is a constant computed for Y = $100 and N = 10 million.

[c]Coefficients not significantly different from zero at 95 percent confidence level.

A. Papandreou (21) made use of Chenery's coefficients to estimate the normal structure of Greek output in 1960, which he then compared with the observed structure for the same year (columns a and b, Table 2.4). Table 2.4 indicates that the observed structure is fairly close to the standard structure. In particular, the primary and manufacturing sectors are surprisingly similar.

Things change drastically when projections were made

Table 2.4. Observed and standard structures of the Greek economy for the years 1960 and 1972[a]

	1960		1972		Projections Based on Investment Trends
	Observed	Standard	Direct	Standard	
	a	b	c	d	e
Primary	30.2	30.2	24.0	21.0	23.1
Manufacturing	19.8	19.1	24.0	25.0	18.1
Electric, Gas and Waterworks	2.0	2.0	4.0	3.0	3.0
Construction	5.6	5.1	13.0	5.0	13.7
Transport	8.0	6.6	6.0	8.0	8.8
Services	34.4	37.0	29.0	38.0	33.3

[a]Source: Table 3.1, columns 3-7, p. 62-63 (21).

for 1972 (columns c and d, Table 2.4). The "observed structure" for 1972 was estimated by incorporating the sectoral growth trends and the GDP growth druing the 1952-1960 period. The standard structure was calculated by making use of Equation 2.35, where Y and N assumed the same values that were used in projecting the "observed structure." Columns c and d in Table 2.4 indicate that undesirable discrepancies were going to develop if the sectoral growth rate experienced during 1952-1960 were to be maintained for the

1965-1972 period. One reason for such developments is the sectoral composition of investment. Column e of Table 2.4 shows the value added of each sector in 1972 which (composition) was estimated by making use of the time pattern of sectoral investment through 1952-1960. The deviations between columns e and d are more pronounced than the ones between c and d. The direction of investment was thus an important force in creating the discrepancies between the observed structure and the standard one.

Similar sectoral contributions were estimated for the year 1965 and projected for 1972 (Table 2.5). Table 2.6 indicates that by 1965 the discrepancies between observed and standard structure were intensified and so the gap at 1972, which was estimated with 1965 as base, will be far greater than the one with 1960 as initial point. It is then obvious that despite the substantial growth that was experienced by the Greek economy during 1960-1965 the direction of growth by individual sectors was very unsatisfactory. Table 2.6 shows the growth rates (r_j) of each sector for the 1960-1965 period. During the 1960-1965 period, the average growth of the manufacturing sector was 8.0 percent (compared with 7.7 percent during 1952-1960) while that of construction was 9.2 percent. The results of such growth trends were to create discrepancies between the observed structure and the standard one.

Table 2.5. Observed and standard structure of the Greek economy for the years 1965 and 1972

	1965		1972	
	Observed	Standard	Projected	Projected Standard
	a	b	c	d
Agriculture	23.3	17.7	18.8	13.4
Mining	1.2	1.7	1.3	1.6
Primary	24.5	19.6	20.1	15.0
Manufacturing	18.2	24.8	20.6	28.9
Gas, Electricity and Water	1.8	2.7	3.0	3.0
Construction	7.4	5.6	9.4	5.7
Transportation and Communication	7.5	7.9	8.5	8.5
Service	40.6	39.1	38.7	38.4

Method:

Column a was estimated directly from NAG for 1965.

Column b was estimated by making use of Equation 2.35 for the gross national income and population that were recorded in 1965.

Column c was estimated by making use of the per capita growth rate of each sector and the per capita growth rate of gross national income during 1958-65. Population was projected at 0.6 percent with 1965 as a base.

Column d was estimated by making use of Equation 2.35 for which gross national income at 1972 was calculated from gross domestic product (projected at 7 percent) assuming that the difference between GNI and GDP remains the same in 1972 as in 1965.

Table 2.6. Sectoral rates of growth for the 1960-65 period (in 1958 prices)

	GDP	Agri-cultural	Mining	Manufac-turing	Construc-tion	Elec-tricity	Transportation and Communications	Service
1960	2.7	-8.6	10.8	9.1	10.9	7.0	8.2	4.1
1961	9.7	18.3	5.5	6.6	8.0	11.4	9.8	5.4
1962	2.5	-7.8	4.5	5.2	7.2	9.2	7.4	5.7
1963	7.2	7.2	6.0	9.8	6.9	12.2	6.9	5.9
1964	7.9	6.0	10.8	8.8	13.8	10.6	7.0	7.5
1965	6.8	2.4	12.4	8.2	8.5	11.1	10.6	7.3
Av. 1960-65	7.3	5.9	8.3	8.4	9.8	10.3	8.3	6.0
Av. 1963-65	7.9	4.4	9.7	9.3	12.4	11.3	8.2	6.9

To change the output mix to a more satisfactory one will be a very difficult task. It will require among other things institutional changes, creation of a strong capital market, elimination of arbitrary governmental regulations, etc. But the main problem will be how to channel more capital resources into the manufacturing sector. Such an investment consideration will be a rather slow process since it will be impeded by the present "habits" of the economy. It is apparent that the main reason for the high rate of growth that the Greek economy has experienced was the investment in sectors with quick returns (particularly dwellings). Now any changes towards other sectors would cause a decline in the growth rate.

E. Thorbecke (25), in a similar study for Peru, calculated two different growth paths for each sector: one path is calculated from standard value added at 1965 to the standard value at 1972, while the other is calculated from the actual value added at 1965 to the standard one at 1972. A similar approach will be followed here. It has already been stated (Chapter I) that the two major needs for a continuous economic growth in Greece are: a) readjustment of the agricultural output; and b) acceleration in the growth of the manufacturing sector.

Starting with the manufacturing sector, two tentative growth rates were estimated for the 1965-1972 period:

first, the growth rate that is required so that the sector's contribution to the GDP is equal to the standard structure (upper limit) by 1972, and secondly, the growth rate that will maintain the present structure (lower limit) (Table 2.7). Although an upper limit growth rate of 14.8 percent is the most desirable one, it seems that it will be impossible to attain. On the other hand, the growth rate of the 1963-65 period--an average of 9.3 percent (an estimated 11.0 percent during 1966)--indicates that it will not be very difficult to meet the lower limit. Furthermore, since the manufacturing sector will have to provide the stimulus for sustained growth through import substitution and export expansion, its (manufacturing sector) contribution to the GDP will have to increase substantially from the present ratio. The five year plan (1966-1970) anticipated an 11.0 percent growth rate for the sector. To achieve an 11.0 percent rate of growth, the share of the manufacturing sector in 1972 will be 23.6 percent which is substantially less than the 28.86 percent that the standard structure implies. As a result, two growth rates were postulated for the sector: 12.0 and 13.0 percent. The 12.0 percent implies a 25.07 percent contribution of the manufacturing sector to the GDP by 1972, while the 13.0 percent implies a 26.86 percent contribution.

Any additional growth in the agricultural sector has

Table 2.7. Projected growth rates for the agricultural, manufacturing and construction sectors for 1965-72 period

	Upper Limit Growth Rate	Lower Limit Growth Rate	1963-1965 Trend
Manufacturing	14.3	9.4	8.9
Agriculture	-1.2	2.8	5.2
Construction	3.0	7.2	9.8

to come mainly from intensifying the production of a number of crops at the expense of the traditional ones (see Chapter I). It is inevitable that a reduction of the sector's share in the GDP will take place by 1972. Table 2.5 indicates that even if the present conditions of sectoral growth are to be maintained, the agricultural sector's contribution will decline, reaching an 18.8 percent ratio of agricultural value added to GDP (which is still substantially higher than the 13.4 percent standard ratio). The relevant upper limit and lower limit growth rates are -1.20 percent and 2.8 percent respectively for the 1965-1972 period. The negative upper limit growth rate indicates that there should be a decline in the absolute value of the agricultural sector's output. The growth path the agricultural sector experienced during the 1950-1965 period is another indication of how unbalanced the growth pattern has been in Greece. It is

important to note that not only does the agricultural sector's share of GDP far exceed the international standards (without the presence of such conditions in Greece as to justify this share, but at the same time Greece has to import most of its meat consumption needs.

It is thus difficult to establish a growth rate for the agricultural sector without taking into consideration structural changes within the sector. A growth rate of 1 percent and 2 percent for the 1965-1972 period implies a 15.6 percent and 16.7 percent ratio of the agricultural sector to GDP in 1972. Compared with the 18.8 percent ratio which was directly projected (Table 2.5) for 1972, the established targets seem to be attainable if the proper policies are employed by the authorities.

During 1967, the electric power output (80 percent of the value added of the sector) fell short of the industrial needs. As a result, any substantial expansion of the manufacturing sector will depend heavily on the available power output. For this reason, the output of the sector is estimated as a function of industrial output (Y_M):

$$Y_E = -515 + 0.119\ Y_M \qquad R^2 = 0.98 \qquad F = 365$$
$$\qquad\quad (117)\ (0.035) \qquad\quad D.W. = 1.12 \quad . \qquad (2.36)$$

Utilizing Equation 2.36, the contribution of the public utilities sector to GDP in 1972 was found to be 2.7 percent

and 2.9 percent with growth rates of 13.5 and 14.6 respectively (compared with 11.33 for 1963-1965 period).

Finally, in order to estimate the output of the service sector (Y_S) Equation 2.37 was used.

$$Y_S = 2282 + 0.384\ Y \qquad R^2 = 0.97 \qquad F = 312$$
$$(850)\ (0.026) \qquad D.W. = 1.22 \quad . \quad (2.37)$$

The basic assumption in projecting output of services through Equation 2.37 is that no substantial changes from past trends is possible to take place. An analysis of the components of this sector will indicate the validity of the assumption. In the public sector (which contributes 22 percent of the sector's value added) there is an absolute need for an increase in the outlay for health and education. No matter how desirable military cutbacks may be there is no prospect that such a reduction will take place. As a result, there is a need for an increase in public outlays which (increase) will not be easy to counter-balance by a decline in rent, trade, banking. The projected contribution of the service sector will be 39.5 percent which implies a 6.6 percent growth rate, compared with a 6.9 percent for 1963-1965 period.

The substantial increase of the manufacturing sector's share will take place at the expense not only of the agricultural sector but also of transport-communication and

construction. However, the substantial expansion of the manufacturing sector (and the existing needs of low income housing) will impose a strong pressure for construction. As a result, two growth rates were assumed 8 percent and 7.2 percent which will bring the construction sector's contribution to GDP to 8.00 percent and 7.50 percent respectively.

The transport and communication share of the GDP was derived as a residual (after 1.3 percent was assumed for mining). This implied a growth rate of 6.2 and 5.8 percent and a contribution of 7.1 and 7.0 percent by 1972.

Table 2.8 shows the two alternative structures for 1972 (columns a-c). The structures imply, of course, a certain sectoral capacity and resource availability which may or may not be forthcoming.

A simple test for capital requirement would be to use incremental capital-output ratios for each sector (ICOR) and to estimate the investment expenditures that are implied by the two 1972 structures. Thus, financial requirements could be determined which would have to be compared with domestic savings. In addition, given exogenous projected receipts of exports of goods and services and using the import to value added ratio, the deficit of current accounts could be estimated. Alternatively, the Papandreou approach could be introduced which utilizes a simple econometric

Table 2.8. Two alternative compositions of the GDP, by sectors, of the Greek economy for 1972[a]

	Structure A		Structure B	
	Share a	Growth Rate b	Share c	Growth Rate d
Agriculture	16.7	2.0	15.6	1.0
Mining	1.3		1.3	
Primary	18.0		16.9	
Manufacturing	25.1	12.0	26.7	13.0
Gas, Electricity	2.7	13.6	2.9	14.7
Transportation and Communication	7.2	6.2	7.0	5.8
Construction	7.2	7.2	7.9	8.0
Service	39.5	6.6	39.5	6.6

[a]Method: see Table 2.5.

model to estimate the domestic resources that are available for financing investment expenditures. The capital requirements are estimated through ICOR and four alternative growth rates of GDP are assumed. This will, of course, give the savings gap. In addition, import requirements are estimated through the use of regression equations. Exports are projected and, furthermore, some rough estimates of import

substitution are also made. Thus, the external gap is estimated. Combining the two, Papandreou concludes that the deficit in the BOP will act as the most important constraint. The unfavorable performance of merchandise exports is the main cause of the external bottleneck. Thus, the Papandreou results reinforce those of Chenery and Adelman (3). In addition, they go one step further to show one reason why the external gap will impede the rate of growth by focusing on sectoral growth.

Concluding Remarks

The studies that have been reviewed in this chapter have indicated that Greece is going to be faced with a rising deficit in the BOP which is primarily the result of an unfavorable composition of output. The deficit in the current accounts that is predicted by the Chenery-Adelman model is approximately 1.1 bil drchm in 1954 prices.

This sizeable trade gap is consistent with a 6.0 percent growth which interestingly enough is the one predicted by the Pavlopoulos model. On the other hand, the Papandreau study, while primarily examining the sectoral growth pattern, arrived at the same qualitative conclusions as the Chenery-Adelman as far as the trade deficit is concerned. The study makes it clear that, if the sectoral growth trends

of the early sixties are maintained, the trade gap will be intensified. Attention was also drawn to the undesirable sectoral structure that will result by the maintenance of the early 1960's sectoral allocation of investment expenditures.

The picture which can be drawn from the previous studies is that unless sectoral performance is improved, further global growth may be difficult to attain. In particular, there must be an acceleration in the rate of growth of the manufacturing sector in order to provide for the needed manufactured exports and, whenever feasible, import substitution. The evaluation of the prospects and implications of such a change in the value-added structure of the Greek economy will require an optimization model which will not be possible to develop here due to the limited information that is available at the present time. Instead an econometric model will be utilized in the next chapter to investigate the potential growth rate of GDP and the capital inflow that is required. In addition, the growth rates of the manufacturing and primary sectors, that are consistent with the overall growth rate, are explicitly introduced.

CHAPTER III AN ALTERNATIVE ECONOMETRIC MODEL FOR THE GREEK ECONOMY

The need of foreign assistance to help achieve economic development is by now taken for granted by both the professional economist and the policy maker. To a large extent the theoretical problem in this area has been treated as an extension of the Investment-Savings (I-S) analysis of Keynes with the addition of an Import-Export (M-E) equilibrium condition. This is the line along which Chenery's "two gap" models have been formulated.

In this chapter and in the first section, a short review of the general two gap model is presented with a criticism of the approach. The second section presents an alternative model in order to examine the impact of foreign aid on development. Finally the estimated model is presented in the third section.

The Chenery-Strout Two Gap Model

H. Chenery and A. Strout (5) in an article in the AER presented a theoretical framework through which the process of economic development could be described and the role of foreign aid could be analyzed.

The Chenery-Strout model has eight variables:

V Gross National Product

C Consumption

I Investment

E Exports

M Imports

S Savings

F Foreign aid

K Capital stock.

The system of equations varies in each stage of development. The first stage of development, limited skill, will be examined here.[1]

There are four accounting equations:

$$M + V = I + E + C \qquad (3.1)$$

$$V = C + S \qquad (3.2)$$

$$M = E + F \qquad (3.3)$$

$$I = S + F \ . \qquad (3.4)$$

Equations 3.1 through 3.4 are not independent since any one of them can be obtained from the other three. For the time being, Equations 3.1, 3.2, and 3.4 will be

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[1]The discussion is based on the article by J. C. H. Fei and G. Ranis (8)

used.[1]

In addition, three behavioral relationships are introduced.

Capital formation is determined by the absorptive capacity of the economy (B).

$$I = I_o e^{Bt} \quad . \tag{3.5}$$

A simple savings function

$$S = (a_o - a')\, V_o + a'\, V \quad . \tag{3.6}$$

Finally a production function of the form

$$V = \frac{1}{k} K \tag{3.7}$$

where k is the capital-output ratio. Equation 3.7 requires an additional relationship in order to link capital (K) with investment (I).

$$K = \int_o^t I dt \quad . \tag{3.8}$$

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[1] In the Chenery-Adelman model for Greece all four are used in a way.
Equation 25 of the Greek model: $M = X + F$,
Equation 26: $V = C + G + I - F$,
Equation 29: $V - C - G = I - F$.
It is apparent that Equation 29 is both Equation 3.2 and 3.4 above. Chenery-Adelman, as will be seen later, use either the one or the other, depending on which one gives the higher value for F.

There are seven independent equations with eight variables. Thus there exists a degree of freedom in the system. First, solution of the system of equations will be traced and then the objection to the Chenery-Strout approach will be discussed.

From Equation 3.8 and Equation 3.5 the capital stock at time t can be estimated as a function of the absorptive capacity of the economy. Next, the level of gross national income, from the production function can be determined. Solving Equation 3.6 the amount of savings is determined which (savings) is used in Equation 3.4 to calculate the required foreign capital inflow. Finally, Equation 3.2 estimated consumption expenditures.

There is one equation left, Equation 3.1, while exports and imports are still undetermined. One way to solve this problem is to project exports and then determine imports as a residual from Equation 3.1.

Chenery and Strout have, instead, introduced two additional behavioral equations, one for E and the other for M. Now there is the reverse problem: there is one more equation than unknowns which implies that the system is overdetermined.

To eliminate the overdeterminancy, it seems that the authors have introduced Equation 3.3, instead of Equation 3.1, and assumed that the F^m from Equation 3.3 measures the

trade gap, which is not the same F^S from Equation 3.4 which measures the savings gap. In other words a gap ($F^m - F^S \neq 0$) between the two gaps exists which, of course, implies a disequilibrium. The disequilibrium that is implicitly introduced by Chenery and Strout is the way in which the overdeterminancy of the model is eliminated.

In the Chenery-Adelman model of Greece which was reviewed in the previous chapter, the overdeterminancy was eliminated by using either one of the two parts of Equation 29 (see footnote on page 94) depending upon which one gives the highest value of F. More precisely, in the model the following equations coexist.

$$S = V - C - G \tag{3.9}$$

$$S = I - F \tag{3.10a}$$

or

$$F^S = I - S \tag{3.10b}$$

together with

$$F^m = M - X \tag{3.11}$$

(from Equation 25 of Chenery-Adelman model),

$$V = C + G + I - F \tag{3.12}$$

(from Equation 26 of Chenery-Adelman model).

Equation 3.11 defines the external gap. Thus the model is overdetermined. What Chenery and Adelman are

doing is to assume that F^s from Equation 3.10b measures something different from the F^m of Equation 3.11. In addition if $F^m < F^s$ Equation 3.10b is used and Equation 3.11 is eliminated, while if $F^m > F^s$ Equation 3.10b is eliminated and Equation 3.11 is introduced. In doing so it is obvious that one is faced with two distinct models and each time the one that gives the larger F is assumed to be the operational one. The introduction of the F^m and F^s cannot solve the problem since ex post $F^m = F^s$ and there can be no $(F^m - F^s)$ disequilibrium.

An Alternative Model

In order to eliminate the overdeterminancy of the Chenery-Strout model Equation 3.1 is introduced as an equilibrium condition rather than as an identify.

Thus the system can be restated as:

$$V_c = f(K_{t-1} ; L_s) \tag{3.13}$$

$$PyV_a = P_c \cdot C + P_i \cdot I + E - P_m \cdot M \tag{3.14}$$

$$C = f(Y_d) \tag{3.15}$$

$$I = f(K_{t-1} ; Y_{t-1}) \tag{3.16}$$

$$M = f(V_a) \tag{3.17}$$

$$F = P_m \cdot M - E \tag{3.18}$$

$$P_c = f(P_y) \tag{3.19}$$

$$P_i = f(P_y) \tag{3.20}$$

$$L_s = Loe^{rt} \tag{3.21}$$

$$V_a = C_p \cdot V_c \tag{3.22}$$

$$C_p = f\left[\frac{V_{at} - V_{at-1}}{V_{at-1}} ; \frac{M_s}{V_a}\right] \tag{3.23}$$

$$V_a = f(C_p ; K_{t-1} ; L_D) \text{ or } L_D = f(V_a ; C_p \cdot K_{t-1}) \tag{3.24}$$

$$F \leq F^o \tag{3.25}$$

where:

E = Exports of goods and services

M = Imports of goods and services

V_a = Actual level of GNP

V_c = Capacity level of GNP

Y_d = Disposable income

C_p = Capacity utilization index

P_y = GNP implicit price index

K = Capital stock

I = Investment

M_s = Money supply

C = Consumption

L_D = Demand for labor

P_c = Implicit price index of consumption expenditures

P_i = Implicit price index of capital expenditures

F = Foreign capital inflow.

There are twelve equations with twelve unknowns: V_C; V_a; C_p; L_S; L_D; P_y; C; I; M; F; P_c; P_i.

The present model will permit the analysis in an explicit way of the obstacles to growth that are caused by either supply limitation or a lack in effective demand. This has been accomplished by determining both capacity output (V_c) and actual output (V_a).

Equation 3.13 is the potential supply production function, in other words it gives the output that is consistent with full utilization of the existing productive factors. On the other hand, Equation 3.22 determines the actual level of output (V_a) which is generated by demand expenditures, that is, by capacity utilization. The capacity utilization is explained by the rate of growth of demand and monetary variable (Equation 3.23).

Thus two situations may arise depending on the relationship of V_C and V_a:

a) If $V_C > V_a$ then the growth rate of GNP can be accelerated by either increasing effective demand and/or eliminating the balance of payment bottleneck. The impact

on V_a by an increase in effective demand can be clearly observed from Equations 3.22 and 3.23. At the same time V_a may have been constrained mainly by foreign capital inflow (F) as can be seen by substituting Equation 3.17 into Equation 3.18.

$$F = (Pm) \cdot f(V_a) - E \quad . \tag{3.26}$$

From F from Equation 3.26 which is consistent with the solution of $f(V_a)$ may exceed the potential F^o, restricting the volume of imports which in turn will restrict the level of output (Equation 3.17). If this is the case an increase in demand expenditure will only create an inflationary situation as the price equation (Equation 3.14) indicates. Since output cannot increase, V_a remains fixed, the increase of money demand, i.e., of the right hand side of Equation 3.14, will result in a rise in the price level (P_y). It is then clear that if $V_C > V_a$, it will be necessary to delineate the causes of underemployment between those that originate in the external sector and those that are caused by lack of effective demand. Of course an additional constraint could have been sectoral imbalances which may in fact be the most important limitation in attaining production of full capacity. To analyze sectoral problems one should introduce not only disaggregate production functions but also the interdependency of the economic system. It

would be easier to investigate such problems through the use of an input-output model.

Equation 3.23 gives the capacity utilization index which can be used to estimate the demand for labor from Equation 3.24.

b) If, on the other hand, further growth is impeded by supply problems, i.e., $V_c = V_a$, then Equation 3.24 collapses to Equation 3.13 since $C_P = 1$ and $L_D = L_S$. Further expansion of GNP will be possible to the extent that the supply of capital and labor can be made available. Under this condition it will be more meaningful to assume a desirable growth rate which is consistent with a certain objective, such as increase in per capita income, or increase in labor productivity, and then estimate capital requirements and capital inflow needs. Thus by introducing alternative growth rates one can estimate a set of resource requirements and establish a tentative relationship between the rates of growth of GNP and F. Since F is assumed to have an upper limit, the range of potential expansion of GNP can be calculated.

The Estimated Model

The data

The main source of statistical information for estimating the equations of the system was the National Accounts of

Greece (NAG) (37). Although the NAG covers the 1950-65 period, all the equations were estimated for 1954-1965 for the following reasons: a) the 1950-54 period is part of reconstruction, a rather typical period and b) in 1953 a 50 percent devaluation of the Greek drachma took place that makes the pre-1953 and post-1953 external sector accounts difficult to compare.

The reliability of the NAG information will not be challenged except for the balance of payment (BOP) statistics and, in particular, the figures for import of goods and services. A comparison of BOP statistics of the NAG with that of the Bank of Greece indicates substantial differences particularly for the 1958-1962 period. It seems that the Bank figures are more reliable since they record a decline or stagnation of imports of goods for the 1958-1962 period, which is consistent with what happened, while NAG reports steady increases for the same period. After a careful examination it was found that the difference between the two accounts was approximately equal to investment in shipping. As a result, since investment in shipping was excluded, the BOP data was taken from the Bank statistics (31). In order to disaggregate imports the "Yearbook of International Trade Statistics" (34, 35) was used.

An important limitation was the lack of flow of funds figures (consistent with National Accounts). For this

reason it will not be possible to estimate the investment capacity of the public sector, and to use government investment as a policy instrument.

The estimation procedure

In order to estimate the behavioral equations of the system, the single equation least square method was utilized. The results were evaluated on the following criteria:

a) The estimated coefficients should agree in size and sign with accepted economic theory, and

b) They should confirm to a number of statistical tests.

Thus it is necessary not only that the value of the marginal propensity to consume is of reasonable magnitude, but that the estimated function should also explain a large part of private expenditures.

The statistical tests that are used here are R^2: the coefficient of multiple regression corrected for the degrees of freedom; the standard error; the F ratio; and finally, the Durbins Watson statistic.

A general overview of the model

The basic features of the estimated model which is shown in Table 3.1 are described next.

Supply has been disaggregated into five sectors. In the absence of detailed information on the labor force the

model contains Harrod-Domar production functions which assume that capital stock is the major constraint to expanding capacity. Demand equations have been estimated for private consumption, capital expenditures and imports while exports and government consumption are exogeneously determined. Implicit prices for the demand groups are mostly explained by sectoral prices and the GNP implicit deflator (P). The overall price index is explained by the level of monetary demand and actual output, while for two sectors, primary and manufacturing, prices are determined primarily by their capacity utilization index (C_p). Equation 3.69 is an equilibrium condition which gives the level of capital inflow (or outflow) consistent with export potential and import requirements of the economy. It is important to note that imports are determined primarily by domestic activity. This approach seems to be consistent with the Greek experience.

In the government sector only current accounts, i.e., taxes, transfers, and public consumption, are explicitly introduced. Public investment, on the other hand, has been grouped together with private capital expenditures. Of course such an approach does not permit the investigation of the extent to which authorities can deliberately influence the productive structure through the allocation of public investment. In addition, the lumping together of

private and public capital expenditures in the production function implies that the impact of each is the same on production which, of course, is not true.

The reason for not introducing a detailed capital account relationship is the lack of flow of funds statistics. Thus, although one could have estimated a rather detailed capital expenditure table, it would not have been possible to introduce the financing of investment. In this respect, it will be difficult to determine, for example, the investment potential of the public sector which of course implies that one cannot meaningfully use government investment as a policy variable.

Finally, the model is closed by introducing Equation 3.32 and 3.33 which give the level of output as a function of its major demand components.[1]

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[1]For an explanation of Equation 3.32 and 3.33, see the section on production functions.

Table 3.1. The estimated model[a]

	Y	R^2	F	D.W.	Equa. No.
Potential supply					
$XAM_c = 20773 + 0.316\ KAM_{t-1}$	-	-	-	-	(3.27)
$XMA_c = 5530 + 0.533\ KMA_{t-1}$	-	-	-	-	(3.28)
$XOM = 5622 + 0.276\ KOM_{t-1}$ (198) (0.005)	14086	0.99	2333	1.81	(3.29)
$XH = 6368 + 0.064\ KH$ (22) (0.001)	9659	0.99	10543	1.08	(3.30)
$XOR = 3431 + 0.405\ XROR$ (714) (0.011)	27481	0.98	1246	1.66	(3.31)
Supply identities					
$XAM_a = -136 + 0.647C + 0.455\ STAM$ (2003) (0.049)A (0.186)	26377	0.94	93	2.69	(3.32)
$XMA_a = 2136 + 0.586\ C_B + 2.376\ C_D$ (536) (0.285) B (0.781) D	15728	0.99	569	2.09	(3.33)

[a]Numbers in parenthesis are the standard errors of the estimated coefficients.

Table 3.1 (Continued)

	Y	R^2	F	D.W.	Equa. No.
Consumption expenditures					
$C_A = 18120 + 0.241\ YDF + 124.651(P_C - P_A)$ $(1132)\ (0.012)\ \ (70.491)$	0540	0.99	895	0.70	(3.34)
$C_B = 1563 + 0.122\ YDF + 69.879(P_C - P_B)$ $(114)\ (0.03)\ \ (26.572)$	10020	0.99	409	3.24	(3.35)
$C_F = 3457 + 0.106\ YDF$ $(265)\ (0.003)$	13321	0.99	1596	1.98	(3.36)
$C_D = 296 + 0.032\ YDF + 58.461(P_C - P_D)$ $(325)\ (0.003)\ \ (13.982)$	3247	0.99	723	2.27	(3.37)
$C_E = -1239 + 0.209\ YDF + 94.901(P_C - P_E)$ $(623)\ (0.007)\ \ (35.683)$	18514	0.99	913	2.46	(3.38)
Investment expenditures					
$IAM = 1333 - 0.165\ KAM_{t-1} + 839\ t$ $(124)\ (0.034)\ \ (107)$	2552	0.97	2.06	1.98	(3.39)
$IMA = -3977 + 0.779\ XMA_{t-1} - 0.235\ KMA_{t-1}$ $(1180)\ (0.218)\ \ (0.107)$	2523	0.94	219	1.75	(3.40)

Table 3.1 (Continued)

	Y	R^2	F	D.W.	Equa. No.
$IH = -4420 + 1.202\,XH_{t-1} - 247.694(P_{IH}-P_I)$ (2390) (0.263) (106.954)	6204	0.93	74	1.08	(3.41)
$IOM = -1573 + 0.511\,XOM$ (462) (0.034)	4993	0.95	221	2.51	(3.42)
$D = -1660 + 0.082\,NI$ (210) (0.002)	5992	0.99	970	1.27	(3.43)
Import of goods and services					
$M_1 = 259 + 0.028\,YDF + 0.023\,AE$ (175) (0.006) (0.016)	2939	0.95	77	1.83	(3.44)
$M_2 = -968 + 0.188XMA + 0.164\Delta E - 621D_3$ (281) (0.019) (0.045) (184)	2007	0.95	77	1.83	(3.45)
$M_3 = -768 + 0.159XMA_{t-1} + 0.189\Delta E - 500D_3$ (501) (0.037) (0.080) (137)	1661	0.82	17	2.60	(3.46)
$M_4 = -1720 + 0.037X + 9.159(P_{MA}-P_{M_4})$ (551) (0.006) (6.889)	1764	0.96	124	1.69	(3.47)
$M_5 = -1680 + 0.0528YDF - 320D_3$ (414) (0.005) (238)	3009	0.96	144	1.00	(3.48)
$M_6 = -875 + 0.024X + 11.472(P_{MA}-P_M)$ (323) (0.003) (6.809)	4276	0.98	170	1.65	(3.49)

Table 3.1 (Continued)

	Y	R^2	F	D.W.	Equa. No.
$M_7 = \underset{(812)}{-6811} + \underset{(0.010)}{0.119X} + \underset{(348)}{647D_2} - \underset{(390)}{554D_3}$	4276	0.98	170	1.65	(3.50)
$M_S = \underset{(240)}{-1436} + \underset{(0.004)}{0.038NI}$	2130	0.99	195	1.45	(3.51)
Public sector					
$T_{ind} = \underset{(769)}{-5394} + \underset{(0.091)}{0.341P_M} \cdot M + \underset{(0.025)}{0.141P_c} \cdot C$	12472	0.99	987	0.90	(3.52)
$T_{pi} = \underset{(150)}{1156} + \underset{(0.001)}{0.023NI} + \underset{(101)}{202D_t}$	3290	0.95	108	1.55	(3.53)
$T_{cs} = \underset{(286)}{-2866} + \underset{(0.003)}{0.083NI}$	4881	0.98	830	1.48	(3.54)
$T_{rg} = \underset{(412)}{-3456} + \underset{(0.004)}{0.104NI}$	6200	0.98	591	1.20	(3.55)
$Y_g = \underset{(86)}{13} + \underset{(11)}{162t}$	1066	0.95	206	1.52	(3.56)
Prices					
$PAM = \underset{(0.4330)}{0.5070} + \underset{(0.2750)}{0.4513C_{PAM}} + \underset{(0.004)}{0.0704St_{in}}$	1.02	0.83	75	1.35	(3.57)

Table 3.1 (Continued)

	Y	R^2	F	D.W.	Equa. No.
$PMA = \underset{(0.2772)}{0.3921} + \underset{(0.2864)}{0.6267}C_{PMA} - \underset{(0.0820)}{0.3114}(P_C - P_M)$	0.98	0.72	15	1.98	(3.58)
$P_A = \underset{(0.0858)}{0.1908} + \underset{(0.0833)}{0.7842}P_{AM}$	0.99	0.89	88	0.98	(3.59)
$P_B = \underset{(0.1306)}{0.4024} + \underset{(0.1320)}{1.3739}P_{MA}$	0.95	0.91	108	1.23	(3.60)
$P_F = \underset{(0.2121)}{0.7137} + \underset{(0.1925)}{0.0246}t$	0.97	0.94	164	0.96	(3.61)
$P_D = \underset{(0.0634)}{0.8182} + \underset{(0.0642)}{0.1793}P_{MA}$	0.99	0.38	8	1.82	(3.62)
$P_{IAM} = \underset{(0.087)}{-0.010} + \underset{(0.087)}{0.981}P$	0.96	0.92	126	1.25	(3.63)
$P_{IMA} = \underset{(0.1700)}{0.6257} + \underset{(0.1705)}{1.6336}P$	0.99	0.90	92	1.29	(3.64)
$P_{IH} = \underset{(0.0798)}{0.2811} + \underset{(0.0800)}{0.6968}P$	0.97	0.87	75	1.15	(3.65)
$P_{IOR} = \underset{(0.0480)}{0.1143} + \underset{(0.0482)}{0.8696}P$	0.97	0.97	325	1.91	(3.66)

Table 3.1 (Continued)

	Y	R^2	F	D.W.	Equa. No.
Change in stocks					
$STAM = \underset{(314)}{205} + \underset{(0.145)}{0.386}(XAM - XAM_{t-1}) - \underset{(0.149)}{0.186}STAM_{t-1}$	509	0.52	7	2.66	(3.67)
Equilibrium conditions					
$PX = P_A \cdot C_A + P_B \cdot C_B + P_F \cdot C_F + P_D \cdot C_D + P_E \cdot C_E + C_g + P_{IAM} \cdot IAM + P_{IMA} \cdot IMA + P_{IOM} \cdot IOM + P_{IH} \cdot IH + P_{IOR} \cdot IOR + P_{st} \cdot STAM + STMA + E - P_M \cdot M - Ms - Y_f - Tind + Sub$					(3.68)
$F = P_M \cdot M + Ms - E - TRF$					(3.69)
National account identities					
$NI = P \cdot X - D + Y_f$					(3.70)
$P_c \cdot YDF = NI - Y_g - T_{se} - T_{pi} + i_g + TRF + T_{rg}$					(3.71)
$C = C_A + C_B + C_C + C_F + C_D + C_E$					(3.72)
$I = IAM + IMA + IH + IOM + IOR$					(3.73)

Table 3.1 (Continued)

	Y	R^2	F	D.W.	Equa. No.
$M = M_1 + M_2 + M_3 + M_4 + M_5 + M_6 + M_7$					(3.74)
$P_c = \sum_i P_{ci} C_i$ where i the individual components of private consumption					(3.75)
$P_i = \sum_i P_{Ij} I_j$ where j the individual component of gross investment					(3.76)
$XROR = XAM_a + XMA_a + XH + XOM$					(3.77)
$X = XROR + XOR$					(3.78)
Capacity utilization index					
$C_{PAM} = \frac{XAM_a}{XAM_c}$					(3.79)
$C_{PMA} = \frac{XMA_a}{XMA_c}$					(3.80)
Capital stock					
$KMA_t^i = KAM_{t-1}^i + I_t^i$ where t = 1950.....1965, and i = each of the five sectors.					(3.81)

Table 3.2. List of variables

XMA_c^{*a}	Capacity value added of the manufacturing sector
XAM_c^*	Capacity value added of the primary sector
XOM_c^*	Value added of electricity-gas-water works and transportation sector
XH*	Value added of ownerships of dwellings
XOR*	Value added of the service sector
XMA_a^*	Actual value added of the manufacturing sector
XAM_a^*	Actual value added of the primary sector
C_A^*	Consumption of foodstuff
C_B^*	Consumption of clothing
C_F^*	Consumption expenditures in rent, water
C_D^*	Consumption of durable goods
C_E^*	Consumption expenditures in services
C_P^*	Total private consumption
IAM*	Investment to the primary sector
IMA*	Investment to the manufacturing sector
IH*	Investment to housing construction
IOM*	Investment to gas-electricity and transportation sector
IOR*	Investment to the service sector
I*	Total gross investment
D	Capital depreciation
STAM*	Change in stocks of the primary sector

[a]All variables with an asterisk are in 1960 prices; all others in current prices.

Table 3.2 (Continued)

STMA*	Change in stocks of the manufacturing sector
M_1*	Imports of foodstuff
M_2*	Imports of raw materials
M_3*	Imports of fuels
M_4*	Imports of chemicals
M_5*	Imports of manufacturing goods I
M_6*	Imports of manufacturing goods II
M_7*	Imports of machinery and transport
M_G*	Total imports
M_s	Imports of services
Y_f	Net foreign income from the rest of the world
E	Export of goods and services
TRF	Current transfer from the rest of the world
F	Surplus or deficit in the balance of current accounts
T_{ind}	Indirect taxes
T_{pi}	Personal income tax
T_{sc}	Social security contributions
T_{rg}	Government transfers to the household
Y_g	Government current income from property
i_g	Interest on public debt
C_g	Government current expenditures on goods and services
S_{ub}	Subsidies

Table 3.2 (Continued)

St_{in}	$\frac{SUB_T}{SUB_{1960}}$ (1960:1.00)
X*	Gross domestic product
YDF*	Disposable income
NI	National income
C_{PAM}	Capacity utilization index of the primary sector
C_{PMA}	Capacity utilization index of the manufacturing sector
KMA*	Capital stock of the manufacturing sector
KAM*	Capital stock of the primary sector
KOM*	Capital stock of the gas-water, transportation sector
KH*	Capital stock of the housing construction sector
P	Implicit deflator of GDP (1960:1.00)
P_A	Implicit deflator of C_A (1960:1.00)
P_B	Implicit deflator of C_B (1960:1.00)
P_F	Implicit deflator of C_F (1960:1.00)
P_D	Implicit deflator of C_D (1960:1.00)
P_E	Implicit deflator of C_E (1960:1.00)
P_C	Implicit deflator of C (1960:1.00)
P_{IAM}	Implicit deflator of IAM (1960:1.00)
P_{IMA}	Implicit deflator of IMA (1960:1.00)
P_{IOM}	Implicit deflator of IOM (1960:1.00)
P_{IH}	Implicit deflator of IH (1960:1.00)

Table 3.2 (Continued)

P_{IOR}	Implicit deflator of IOR (1960:1.00)
P_{ist}	Implicit deflator of STAM (1960:1.00)
P_I	Implicit deflator of I (1960:1.00)
P_{M_4}	Price index of imported chemicals (1960:1.00)
P_{M_6}	Price index of imported manufactured goods (1960:1.00)
P_M	Price index of imported goods (1960:1.00)
P_{AM}	Implicit deflator of XAM (1960:1.00)
P_{MA}	Implicit deflator of XMA (1960:1.00)
D_2	Dummy for import equations taking the value of -1 for 1959 0 for all other years
D_3	Dummy for import equations taking the value of 1 for 1961-65 0 for all other years
D_t	Dummy for personal income tax equation taking the value of -1 for 1959 and 1965 and 0 for all other years
t	Time: 1 for 1954

The equations of the model

Consumption In explaining consumption expenditures, demand was disaggregated into five components:

C_A - Consumption of foodstuff, tobacco and beverages;

C_B - Consumption of clothing, footwear and other personal effects;

C_F - Consumption expenditures in rents, water, fuel and light;

C_D - Consumption of durables; and

C_E - Expenditures on services.

The basic assumption that is made for explaining consumption is that disposable income is the relevant variable for consumer decision making. Nevertheless, the use of total disposable income as an explanatory variable (due to lack of more detailed data) introduces a serious limitation into the model since it makes it impossible to investigate the impact of changes in the income distribution on consumption expenditures. In other words, in the absence of income distribution implies that a change in the tax structure has the same influence upon all income levels, which of course is true only for a very particular tax policy.

In addition to the disposable income, relative prices were also found to be important explanatory variables in four of the consumption equations.

The estimated marginal propensity to consume (mpc) in Equations 3.34 and 3.38 is .710, which is higher than the .629 that Suits (23) calculated for the 1951-61 period. The trend is of course contrary to what economic theory would have predicted. A more careful examination of the Suits and in the Chenery-Adelman studies will reveal that the mpc which was estimated in both studies, from consumption function of the simple form $C_i = f(Yd)$ (where Yd is disposable income), is a high .877 for the 1950-61 period for Chenery-Adelman, while that of Suits is .795.[1] The explanation for the difference in the mpc when additional explanatory variables are included in the Suits study is primarily due to the multicolinearity that is observed among most of the series used in his study. On the other hand, in the present study, the coefficients remained relatively stable and the mpc from the Ci = f(Yd) relation is .710.

Investment As has been the experience with other econometric studies on Greece, the explanation of investment expenditures was the most difficult part of the study.

At first, it was decided that it would be appropriate to introduce capital expenditure by sector of destination rather than by type, given the nature of the present model.

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[1]The discrepancy in the mpc between the Suits and Chenery-Adelman studies is due to the difference in the value of the disposable income that was used in the two studies.

Fixed capital formation was broken down into five groups:

IAM - Investment in the primary sector;

IMA - Investment in the manufacturing sector;

IOM - Investment in the gas-electricity and transportation sectors;

IH - Investment in the housing sector; and

IOR - Investment in the service sector (exogeneously determined).

M. Kalecki (11) in his "Theory of Economic Dynamics" has explained fixed capital formation by a) the level of corporate savings b) the rate of profit and c) the stock of fixed capital (11; pp. 96-98).

According to M. Kalecki the level of corporate savings will determine to what extent new investment will be financed by the "internal" (to the firm) accumulation. In addition investment may be financed by new (outside the firm) funds on the strength of the accumulation of entreprenurial capital.

The rate of profit will determine the profitability of each project. A rise in the rate of profit will make attractive certain projects which were previously considered unprofitable.

Finally the rate of increase of capital equipment affects adversely the level of investment. A rise in the

volume of capital equipment, ceteris poribus, implies a reduction in the rate of profit and thus makes a number of projects unattractive which were previously considered profitable.

If it is also assumed that both corporate savings and profits depend positively on GNP then it can be seen that investment can be explained by GNP (positively) and by capital stock (negatively). This simplified formulation is particularly appropriate for Greece because of the absence of profit statistics.

With the exemption of the manufacturing sector's investment function, it became necessary to modify the basic equations for the other sectors.

In the agricultural sector, the value added variable was replaced by a time trend to account for changes in the rate of profit and rise in productivity. Investment in the housing and in the transportation sectors were found to have a positive correlation with capital stock which implied that investment behavior was dominated by psychological and other noneconomic factors. In the investment function of the housing sector the capital stock variable was replaced by the difference of the implicit price level of investment from that sector from the implicit price level of total investment. This relative price indicates the relative profitability of investing in dwellings in comparison to

the other sectors.

Imports of goods and services Imports of goods and services were broken down into seven groups in accordance with the International Trade Statistics Index of the United Nations.

M_1 = Imports of foodstuff

M_2 = Imports of raw material

M_3 = Imports of fuels

M_4 = Imports of chemicals

M_5 = Imports of manufactured goods I

M_6 = Imports of manufactured goods II

M_7 = Imports of machinery and transport.

The trends in imports of goods for the 1954-1965 period can be divided into three distinct subperiods. First, the 1954-1958 period which is characterized by an upward trend. During the second period, that of 1959-1961, there is a downward movement in 1959 followed by a slow recovery in 1960 and 1961. Finally, in the third period, from 1961 onwards, imports have been growing at a very high rate.

A similar trend has been observed in the growth rate of the GNP and the question that arises concerns the direction of casuality, i.e., GNP = f(M) or M = f(GNP). The economic interactions are more complex than that of a simple linear relation but there is some evidence to permit one to state that for the 1954-1960 period, the level of imports was

Table 3.3. Linear regressions for explaining industrial output (XMA) as a function of industrial capital stock (KMA) and imported raw material (RMR)

Period	Constant	KMA_{t-1}	MRM	R^2	D.W.	F
1954-1965	4678 (467)	0.433 (0.024)	0.397 (0.198)	0.99	1.13	807
1954-1959	3576 (1192)	0.358 (0.099)	0.812 (0.405)	0.95	1.78	54
1960-1965	4732 (946)	0.513 (0.037)	0.126 (0.365)	0.98	2.56	133

important in determining domestic output while for the 1960-65 period, the reverse seems to be true, i.e., the level of output determines the import requirement. This is true in particular in the relationship of imports of raw material and fuel ($M_2 + M_3 + M_6$) to industrial output (XMA). Table 3.3 presents the regressions for different periods, relating industrial value added (XMA) to lagged capital stock (KMA_{t-1}) and the import of raw material (MRM). The relationship holds for 1954-1965 and 1954-1959, while it fails to satisfy the t-test for the MRM coefficient for 1960-65. Furthermore, the MRM coefficient for 1954-59 is the highest, while that of KMA_{t-1} is one of the lowest. The estimated equation for 1954-1959 indicates that manufacturing value added would have grown considerably if additional raw material was forthcoming. On

the other hand, after 1960, the level of MRM does not help explain variations in industrial production. Output of the manufacturing sector after 1959 is independent of the import of raw materials. It may be concluded, tentatively that, on the basis of the results of Table 3.3, the availability of raw materials was an important factor for industrial growth in the 1954-1959 period while manufacturing growth most probably determined the import level for the 1960-65 period. Finally, the regression results, even for the 1954-1959 period, should be taken with some caution due to the strong multicolinearity between MRM and KMA_{t-1}, which resulted in a highly unstable coefficient for KMA_{t-1}.

In order to examine the import-GNP relationship at a disaggregate level for imports, demand elasticities for six groups of imports were estimated. The demand elasticities will also help investigate the importance of import substitution in curtailing the demand for imports, particularly during the 1960-1965 period (see Table 3.4).

Manufactured goods (M_5) are mostly of the high income elasticity type of consumer goods and, as should have been expected, the GNP elasticity of demand for these imports was higher in the second period than in the first. For the rest of the groups, the situation is as follows: imports of raw materials (M_2) and fuels (M_3) show a substantially higher income elasticity in the second period than in the first. This

Table 3.4. Import elasticities: $M_1 = AX^a$

		1954-1960 a	1960-1965 b
M_2	Raw material	1.05	1.63
M_3	Fuels	0.59	1.62
M_4	Chemicals	2.99	2.13
M_5	Manufactured I	1.31	1.97
M_6	Manufactured II	2.89	1.42
M_7	Machinery and Transport	2.66	2.28

was caused by the acceleration in the rate of growth of the industrial sector during the second period which required a constant expansion in the import of raw material.

In order to introduce into the model the import substitution effect a dummy variable (D_3) was utilized which takes the value of one from 1961 onwards. The negative sign in Equation 3.45 can be interpreted as an indication that import substitution kept the rate of increase of the demand for imports lower than otherwise.

For chemicals (M_4), the income elasticity was substantially lower in the second period. The main reason for this is the strong import substitution that took place in the sector, particularly in fertilizers. The dummy variable

(D_3) was found to have a high degree of multicolinearity with the relative price of imports ($PMA-P_{M5}$), and for that reason was not used. Similarly, for iron and steel products (M_6), the income elasticity was in the second period almost half of what it was in the first. The lower income elasticity in the second period is due primarily to the fact that import substitution has been very extensive in the sector.

Finally, for M_7, i.e., machinery and transport equipment, the elasticity has not changed very much, due to combination of the following developments: import substitution (some machinery, electrical appliances), increase in consumer demand (passenger cars, electrical appliances), and rise in the demand for machinery for industrial development. These three developments have been captured once more with the dummy variable (D_3).

In summary, it seems that there is some evidence for saying that import substitution during the 1960-65 period helped to keep the value of imports at a manageable level. The question that is not investigated here is to what extent the import substitution that took place was in those lines of production for which Greece has a comparative advantage.

The deficit in the balance of trade that Greece has experienced throughout the period was financed either with

foreign aid, during the first period or with the surplus in the balance of invisible and foreign capital inflows during the second period. The import slump of 1959-61 was as a result of restrictions caused by a severe reduction in foreign exchange because of a) bad export performance; and b) the elimination of foreign aid. In order to account for the impact of foreign exchange availability on the level of imports, the lagged export earnings (E_{t-1}) (of goods and services) and the (annual) changes in export earnings (ΔE) were introduced. The former (E_{t-1}) did not give good results while ΔE was found to improve the relations in M_1, M_2 and M_3 and also M_7. Nevertheless ΔE was not used with M_7 because of high multicolinearity and, instead, a dummy variable (D_2), which takes the value of -1 for 1959, was introduced.

Price variation and, in particular, the fluctuation of relative prices of domestic goods to imports goods, are expected to have some impact on the level of imports. In the present study, relative prices were defined as the difference between primary's or manufacturing's sector price index and the relevant import group's price index.

Table 3.5 shows the results of simple linear regression of imports by group and relative prices. For foodstuff (M_1) and primary raw material (M_2), the price of the primary sector was chosen as an index of domestic prices while for the rest of the groups, the cost index of the manufacturing sector was

Table 3.5. Linear regression of imports to relative prices

				R^2	D.W.	F
M_1 =	2871 (176)	+ 3849 (1272)	$(P_{AM}-P_{M_1})$	0.42	0.90	9
M_2 =	1940 (73)	+ 4246 (577)	$(P_{AM}-P_{M_2})$	0.83	1.87	54
M_4 =	2016 (128)	+ 4961 (820)	$(P_{MA}-P_{M_4})$	0.76	0.49	36
M_5 =	3112 (186)	+ 9530 (2060)	$(P_{MA}-P_{M_6})$	0.65	0.79	21
M_6 =	1548 (758)	+ 5845 (758)	$(P_{MA}-P_{M_6})$	0.84	1.37	59
M_7 =	4852 (1114)	+ 8646 (13767)	$(P_{MA}-P_{M_7})$	-0.05	0.16	0

thought to be the relevant one.

The strong relationship between M_4, M_5 and M_6, and relative prices, is an indication that prices should be taken into consideration for explaining import trends. Relative prices were not introduced in the M_5 function because of the multicolinearity that was observed with the rest of the explanatory variables. On the other hand, M_7 shows no relationship with relative prices, which indicates that prices are of secondary importance in explaining the level of capital imports. This of course reinforces the argument that the

level of imports of capital goods is determined by demand requirements, particularly in an economy that has a very small capital goods sector.

Output by sectors In the present study, production functions of the Harrod-Domar type were estimated for five sectors.[1]

The problem with supply functions of the form $X = f(K_{t-1})$ is that, while the capital stock (K_{t-1}) used for estimating such production functions is the total capital stock available in the economy, at the same time the recorded level of output may not be equal with capacity output. For this reason the resulting incremental capital-output ratio will be higher than the real one, which in turn will imply a higher capital requirement for attaining a given growth rate than otherwise. To eliminate this problem in the present model supply equations for primary and manufacturing sectors, Equations 3.27 and 3.28 are estimated by assuming full capacity for both capital stock and output. This was accomplished by fitting a regression line through the peak points of the scattered diagram of output vs. capital stock. Of course, the possibility exists that some of the peak points are not full

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[1]Due to the absence of capital stock figures, the accumulated annual gross investment has been used instead. Thus, the K_i for sector i at time t is:

$$K_{it} = \sum_{t=1}^{n-1} I_{it} \qquad t = 1950 \text{ to } 1965 \quad .$$

capacity ones but are rather simple turning points. In the present case additional information was used to make sure that only full capacity years were utilized to calculate the capacity output equations. Once this equation was estimated, the capacity output for each year was calculated. The ratio of actual output to capacity output is the capacity utilization index.

As was already mentioned, in order to close the model, actual output for primary and manufacturing sector was determined by approximating the input-output identity equation. The following presents the derivation of Equations 3.32 and 3.33.

From the demand side, total demand (X_j) by sector j is equal to interindustry demand ($\sum_j X_{ij}$) and final demand (F_i).

$$X_j = \sum_j X_{ij} + F_j \quad . \tag{3.82}$$

From the supply side, total supply from sector j (S_j) is equal to total interindustry supply ($\sum_i X_{ij}$) plus value added (V_j) plus imports (M_j).

$$S_j = \sum_i X_{ij} + V_j + M_j \quad . \tag{3.83}$$

If it is assumed that there is a constant relationship between value added, and interindustry deliveries for sector j of the following form:

$$\sum_i X_{ij} = AV_j \tag{3.84}$$

and that the same form of relationship holds between final demand and interindustry demand.

$$\sum_j X_{ij} = BF_i \tag{3.85}$$

then Equations 3.82 and 3.83 could be rewritten as:

$$X_j = BF_i + F_i \tag{3.86}$$

$$S_j = AV_j + V_j + M_j \tag{3.87}$$

and since by definition:

$$X_j \equiv S_j \tag{3.88}$$

one can have a relationship between final demand and value added at the sectoral level:

$$(1 + B)F_i = (1 + A)V_j + M_j \tag{3.89}$$

or

$$V_j = \frac{1 + B}{1 + A} F_i - \frac{1}{1 + A} M_j \quad . \tag{3.90}$$

In general, the F_i can be decomposed into:

$$F_i = C_i + C_{gi} + I_i + \Delta St_i + E_i \quad . \tag{3.91}$$

In the agricultural sector, it can be easily assumed that $I_{AM} = 0$, $Cg_{AG} = 0$. On the other hand, C_i is consumption of foodstuff (C_a). The rest are approximated by variations

in stocks because any fluctuation in exports and imports will have an immediate effect on accumulated stocks.

The manufacturing sector's identity is approximated by the consumption of durable goods and textiles because most of the output of the sector is domestically consumed.[1] The estimated form of Equation 3.33 for the manufacturing sector greatly reflects the productive structure of the sector for the 1950-1965 period.

Thus the estimated Equations 3.32 and 3.33 of the model must be seen as identities which equate the value added of a sector with its major demand components (with a fixed proportion).

Next, the incremental capital-output ratios (ICOR), from the Harrod-Domar production function, are compared with the ones estimated by A. Papandreou (21) by a different method for both the 1950-1965 and 1950-1960 periods (Table 3.6).

With the exception of the manufacturing sector, there are substantial differences in the estimated ICOR from the two methods. The main reason for the resulting differences is that Papandreou has eliminated years that were assumed to be atypical, while in the present study, the regression coefficient is estimated by making use of all observations.

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[1]The other components of the final demand (imports, exports and investment) are represented by the constant term on the regression equation.

Table 3.6. A comparison of ICORS from the present study with those of Papandreou (21)

	Papageorgiou		Papandreou
	1950-1965	1950-1959	1948-1960
Primary	2.53	1.33	3.50
Manufacturing	1.93	2.08	2.00
Dwellings	15.38	14.43	11.00
Elect.-Gas, Trans. and Comm.	3.88	3.72	9.00

Table 3.7. ICOR's for the four sectors and for four time periods

Sector/Period	1 1950-65	2 1954-65	3 1950-59	4 1954-59	5 1960-65
Agriculture	2.50	1.30	3.20	2.10	2.50
Manufacturing	1.90	2.10	1.90	1.90	1.80
Electricity and Transportation	3.90	3.70	3.90	4.40	4.10
Housing	15.40	14.40	13.90	13.60	13.90
GDP	3.30	3.40	2.80	3.80	3.00

In order then to determine how reliable the ICOR's of Equations 3.27, 3.28, 3.29 and 3.30 are, a test was made to evaluate how sensitive the (ICOR) are for subperiods (Table 3.7). With the exception of the agricultural and the overall ICOR's, the other three sectors seem to have a rather stable incremental capital-output ratio. The violent variations in the primary sector's ICOR are due to the seasonal output fluctuation of the sector. Nevertheless, the observed fluctuations in the sector's ICOR are not inconsistent with with the overall developments. The early period, particularly 1950-1957, is characterized by an accelerated growth (because of reconstruction) which was possible with little investment. During 1957-1960 output grew at a very low rate and from 1961 onwards, there was a substantial rise in output while at the same time, capital expenditures also increased considerably. Thus, while the 1950-1959 ICOR of the primary sector is rather low, the 1950-1965 ICOR is the same as that of 1960-1965.

It is apparent that there is a tendency for a decline in the ICOR of the housing and manufacturing sectors. The same is true for the overall incremental capital-output ratio. Such a trend is consistent with economic theory. In the transportation sector the ICOR for 1960-1965 is lower than 1954-1965, but still higher than the other periods. Since 1950-1954 is a rather atypical period, particularly for this sector, it is rather safe to conclude that the trend is in

the right direction.

Prices The overall price level is determined by the equilibrium condition, Equation 3.72. It is important nevertheless to note the process.

The capacity utilization index (C_p) for the primary and manufacturing sectors, determines the sectoral price level $P_{AM}P_{MA}$) which in turn determines the implicit price index for consumer goods. Thus, the overall price index is indirectly influenced by C_p, i.e., by demand and supply consideration. The closer C_p is to one, the stronger will be the tendency for prices to rise if capacity output does not expand.

The primary sector's price index was also explained by the index of public subsidies. Most of the subsidies are payments by the government to the farmers and, to a certain extent, reflect the price support program. It was felt that in the absence of an actual price support series, the subsidy index could be used as an approximation. In this respect, it indicates the extent to which high price supports have an impact on the production costs of the sector.

In the manufacturing sector, the price index was explained by the capacity index and by the extent to which import prices affect the production costs of the sector.

Public sector Four equations were estimated for the public sector, all in current prices. The reason for using current prices is that public authorities are mainly interested in money income rather than real income, particularly in a noninflationary economy.

Indirect taxes were explained by private current expenditures and the import of goods. The resulting coefficients in Equation 3.52 indicate that import fluctuations tend to have, on the margin, a higher impact on indirect taxes than that of consumption expenditures. As a result, any reduction in import duties will have a considerable effect on government revenue since indirect taxes account for about 70 percent of tax revenue.

Personal income taxes (T_{pi}), social security contribution (T_{sc}) and government transfers (T_{rg}) were explained by national income. In addition, income tax elasticities were estimated to examine extent to which the growth of T_{pi}, T_{sc} and T_{rg} has reflected the increase of national income.

Table 8 shows the $^{e}T_{pi}$ is very low indicating either a) regressive tax system; b) tax evasion; or c) a redistribution of income towards income groups outside the taxable ones. The previous observation is reinforced by the fact that the constant of Equation 3.53 is positive, indicating that the average tax rate is greater than the marginal one, which is exactly the opposite of the desirable objective.

Table 3.8. Tax elasticities (e_i) estimated by: $T = A(NI)^e$ for 1954-1965

$e_{T_{pi}}$	.47
$e_{T_{cs}}$	1.95
$e_{T_{rg}}$	1.80

On the other hand, the high $e_{T_{cs}}$ should be compared with that of $e_{T_{rg}}$. What is implied here is that the accelerated growth of social security contributions has permitted the almost complete financing of the government transfers. In this respect, T_{sc} is not a net contributor to government revenue for current and capital expenditure and its high rate of growth was necessary to meet the growth in transfer payment.

Identities Finally, the model is closed by the national account identity. Nevertheless, Equation 3.68 and 3.69 should be understood as equilibrium conditions rather than as identities.

The individual equations of the model perform very well during the sample period. A number of them, nevertheless, need improvement from the point of view of incorporating some important elements of the economy. In the investment

equations, for example, the behavioral pattern of the Greek and foreign investor should be incorporated to replace the simple accelerator form that was used. The interaction among rate of profit, capital availability and investment would had given additional information about the development process in Greece. Unfortunately, the needed statistical information was not available and the present form was the second best.

Another issue is how the model operates as a whole; i.e., is the satisfactory performance of individual equations maintained when the model is solved as a system of interdependent equations?

The next chapter will deal exclusively with this question.

CHAPTER IV THE PERFORMANCE OF THE MODEL

In the first section of this chapter the ex post forecasts from the model that was presented in Chapter III and for the sample period, are estimated. Any discrepancy between the values forecasted, for the endogenous variables and those actually observed, are therefore due to the model proper. Thus, the ex post forecasting record will give, at least, some idea of how reliable the model is.

In the second section the estimated errors for each endogenous variable, that are derived from the difference between observed values and forecasted values, are analyzed by making use of Theil's inequality coefficient.

Finally, in the last section, the performance of the model outside the sample period is evaluated.

Performance of the Model Over the Sample Period

A most important test of the reliability of an econometric system for projections is to examine how the model performs over the sample period. An additional test will be to solve the system for post sample years and compare the predicted values with the observed ones, if data is available.

The solution of the present econometric system will be presented for 1955-65 and also for the post sample period 1966-1967.

The forecasting method that will be used here is what A. Goldberger has called the "final method" (9, p. 51) and it is considered to be the most severe test to which an econometric model can be subjected to determine its reliability. According to the final method the model is supplied only with the values of exogenous variables and the first year's values of the lagged endogenous. For the rest of the time period the model will draw from its own last year solution to provide values for the lagged endogenous.

In this section the sample performance of the model will be examined and the degree of deviation of predicted values from the actual ones will be investigated by making use of Theil's coefficients (24).

In Table 4.1 the predicted values of the major variables are shown next to the observed ones.

The model appears to describe relatively well most of the variables. The Theil's test is used next to determine the causes of variation in the actual and estimated values.

Measures of Inequality

Theil's inequality coefficient is of the following form:

$$V = \frac{\sqrt{\frac{1}{m}\sum (P_i - A_i)^2}}{\sqrt{\frac{1}{m}\sum P_i^2} + \sqrt{\frac{1}{m}\sum A_i^2}} \qquad (4.1)$$

Table 4.1. Observed and predicted variables of the major endogenous variables 1955-1965 (in m. drachma 1960 prices)

	$\hat{X}$	X	$\hat{F}$	F	$\hat{C}_P$	C_P	$\hat{I}$	I	$\hat{M}_G$	M_G
1955	74057	73711	1086	1200	64169	66889	10170	11255	10468	10617
1956	78478	78185	2412	3360	69712	71463	12606	13541	11930	12211
1957	81828	84157	2579	3060	72351	75535	14216	13257	13693	13332
1958	85523	86321	2119	2910	75934	78172	16037	17157	13993	15255
1959	87403	90012	1963	1650	75573	79428	18302	18132	13842	13853
1960	92593	92465	3391	2610	79528	83382	20288	20148	16297	15604
1961	99956	102445	2559	2700	88002	88956	21767	22104	17505	17654
1962	107549	105078	3420	3180	96269	93702	24513	24338	20543	19283
1963	113647	113229	2856	2400	101751	100287	27725	26921	23202	22740
1964	124493	122884	6228	6150	114133	109208	30135	31157	26440	24964
1965	132175	131828	7684	8190	121497	117187	33904	35231	29790	30966

Table 4.1 (Continued)

	$\hat{T}_{ind}$	T_{ind}	$\hat{T}_{sc}$	T_{sc}	$\hat{T}_{pi}$	T_{pi}	$\hat{T}_{rg}$	T_{rg}	$\hat{XMA}$	XMA
1955	6783	6920	2290	2515	2609	2472	2974	3335	11284	10836
1956	8278	7994	2904	2886	2781	2870	3739	3807	12320	12047
1957	9597	9015	3252	3298	2879	3194	4173	4219	13144	12869
1958	9808	10113	3657	3510	2994	3213	4678	4735	13797	13962
1959	9757	10394	3567	4017	2766	2929	4566	5077	14058	14254
1960	11000	11310	4005	4613	2890	3037	5112	5622	14843	15683
1961	12678	13282	5079	5343	3394	3422	6452	6341	16414	16790
1962	14907	14828	6039	6354	3665	3577	7649	7358	17946	17703
1963	16766	17159	6707	7128	3853	3725	8481	9098	19176	19635
1964	20423	19848	8503	7760	4359	4378	10722	9987	21768	21523
1965	23281	22993	9623	9267	4473	4330	12118	12040	23535	23455

Table 4.1 (Continued)

	$\hat{XAM}$	XAM	$\hat{P}$	P	$\hat{P}_{AM}$	P_{AM}	$\hat{P}_{MA}$	P_{MA}
1955	22344	22605	0.90	0.87	0.97	0.90	1.02	0.93
1956	23322	23321	0.94	0.95	0.98	1.00	1.05	0.99
1957	23802	26324	0.95	0.95	1.00	0.95	1.06	0.99
1958	24306	24471	0.97	0.96	1.02	0.98	1.03	0.98
1959	24096	25653	0.94	0.96	1.02	0.92	1.00	1.01
1960	25267	23808	0.94	1.00	1.00	1.00	0.99	1.00
1961	27086	28965	1.00	1.02	1.04	1.03	1.01	1.01
1962	28915	26997	1.04	1.05	1.04	1.09	1.03	1.02
1963	29692	29079	1.05	1.07	1.08	1.13	1.02	1.01
1964	32229	30993	1.14	1.10	1.19	1.17	1.04	1.02
1965	32972	32715	1.17	1.15	1.29	1.26	1.03	1.04

where P_i is the predicted value A_i is the actual one and $i = 1...m$.

The value of V varies from 0 to 1 with $V = 0$ implying perfect prediction.

To determine the source of error, in the case that $V \neq 0$, the numerator of Equation 4.1 is decomposed in the following way:

$$\frac{1}{m}(P_i - A_i)^2 = (\bar{P} - \bar{A})^2 + (S_P - S_A)^2 + 2(1 - r)S_P S_A \qquad (4.2)$$

where $\bar{P}$, $\bar{A}$ are the mean values of P and A, respectively, S_P, S_A are the standard deviations of each series and r is the correlation coefficient relating the P_i and A_i series. Defining:

$$V_m = \frac{\bar{P} - \bar{A}}{D} \qquad (4.3)$$

$$V_s = \frac{S_P - S_A}{D} \qquad (4.4)$$

$$V_c = \frac{\sqrt{2(1-r)S_P S_A}}{D} \qquad (4.5)$$

where D is the denominator of Equation 4.1. If V_m^2, V_s^2 and V_c^2 are divided by V^2 the following relation is found:

$$V^m + V^s + V^c = 1 \qquad (4.6)$$

where

$$V^m = \frac{V_m^2}{V^2}, \quad V^s = \frac{V_s^2}{V^2}, \quad V^c = \frac{V_c^2}{V^2} \quad .$$

From Equation 4.6 the source of error can be determined:

V^m is the partial coefficient of the proportion of inequality due to unequal central tendency;

V^s is due to unequal variation;

V^c is due to imperfect covariation;

V^m is undesirable since it exhibits a systematic error of over-estimation ($\bar{P} > \bar{A}$) or underestimation ($\bar{P} < \bar{A}$).

Such an error is due to either the structure of the model or the method of estimation of the parameters. This type of error will significantly limit the use of the model for making structural changes in the system since the exact point of bias cannot be determined because of the multiplicative structure of the reduced form.

V^s is also undesirable because $S_P \neq S_A$ will imply that essential explanatory variables have been excluded from the model (i.e., the predicted values move considerably different from the actual ones). The mere existence of $S_P = S_A$ is not enough to ensure that the all explanatory variables have been included. It is also necessary that the r^2 of the two series be high.

V^c is an unsystematic error since it is caused by

imperfect correlation between actual and predicted values. It is a random error and if $V^m = V^s = 0$ (or close to 0), it implies that the model is a good one since there is no bias and no essential explanatory variables have been excluded.

The above concepts were utilized to test the most important endogenous variables. In Table 4.2, the results are shown.

With the exemption of T_{sc} and F, the variation in the actual and predicted value was less than 5 percent.

On the percentage contribution to the total error, the V^m share was uniformly low while that of V^s was rather high. The high percentage figure of V^s in consumption implies that either some explanatory variables were omitted, or the ones that were used ought to have been on a disaggregate level. As was stated in the discussion on the consumption function, the absence of income distribution series (on the disposable level) introduced a very undesirable feature from policy point of view. It seems now that the absence of income distribution statistics has an additional drawback by limiting the predictive ability of the model. As can be seen in Table 4.1, the estimated consumption expenditures tend to be underestimated up to 1960 and from there on to be overestimated. One explanation could be that during the two subperiods, the different components of the national income did not grow at the same rate. Thus, if, for example,

Table 4.2. Measures of inequalities for the estimated series (in percentage)

	Percentage error	Error due to unequal central tendency		Error due to unequal variation		Error due to imperfect covariation	
	V	V^m	+	V^s	+	V^c	= 100.0
GDP	1.13	2.20		15.73		82.07	
Private consumption	2.45	2.36		77.05		20.59	
Investment	2.68	14.78		0.89		84.33	
Merchandise imports	2.66	14.65		0.86		84.49	
Indirect taxes	2.14	0.97		7.52		91.59	
Social security contributions	4.95	6.16		19.55		74.29	
Personal income taxes	3.23	13.49		18.20		68.31	
Net transfers to the private sector	3.92	4.91		18.71		76.38	
Manufacturing sector	1.59	1.59		1.21		97.20	
Foreign capital inflow (net)	9.58	3.71		1.83		94.46	

disposable income of the higher income groups had risen at a higher rate than overall income, this would imply that luxury consumption expenditures would most probably be underestimated.

In Table 4.3 the source of error for the five consumption functions is presented. Although for all five the undesirable component of V, i.e., V^m and V^s is over 50 percent, the contribution in C_A, C_B and C_D is over 75 percent. These three types of consumption expenditures (C_A, C_B and C_D) are the ones that were affected the most by the change in income distribution in Greece. Demand for foodstuff will have a lower income elasticity for high income groups than for low ones. Thus, a faster rate of growth in the high income group will result in a very slow increase in demand of C_A and vice versa. (This is precisely the relation of the growth rates of agricultural and nonagricultural incomes which could be taken as proxy variables for low and high income, respectively.) By introducing a single disposable income variable, variations in the growth rates of different income groups are not taken into consideration and, instead, a single rate of growth is introduced which is that of the aggregate disposable income. The situation in C_B and C_D seems to be worse since the absolute error is also very high, 5.10 percent and 4.10 percent, respectively. If the trend of overestimation continues then the overall consumption figure

Table 4.3. Measures of inequality for the consumption estimates (in percentage)

	Percentage error	Error due to unequal central tendency		Error due to unequal variation		Error due to imperfect covariation
	V	V^m	+	V^s	+	V^c = 100.0
Consumption of foodstuffs	1.73	3.24		71.72		25.04
Consumption of clothing	5.10	1.94		82.72		15.34
Consumption expenditures in water, rent, electricity	2.45	5.27		56.87		37.88
Consumption of durable goods	4.10	41.87		38.47		18.68
Consumption expenditures in services	3.16	0.00		58.37		41.63

in the projections will be on the higher side.

The Post-Sample Period

The econometric model performed relatively well, with the exception of private consumption, over the sample period. In this section, the predictive ability of the model is examined for the post sample period for which information is available. At the present time, there exists a complete set of statistics for 1966 and 1967.

Before proceeding with the post sample projections, an examination of the economic events between 1965-68 was made to see if important structural changes did take place that could be incorporated into the model. Although this could be a dangerous undertaking, since it is not easy to say whether or not an observed economic change is temporary, useful information can sometimes be gathered to improve the forecasting ability of the model. In the case of Greece, the military coup d'etat of 1967 affected most of the major economic variables, but it is not easy to introduce these noneconomic variables into the present model. The investigation, nevertheless indicated that in the case of personal income tax (T_{pi}), there seems to be a need for introducing a new equation. As can be recalled from Table 3.8 of Chapter III, the income elasticity of personal tax for 1954-65 was extremely low, a mere 0.48. During 1966 and 1967, nevertheless, the rate of growth of T_{pi} was substantially higher than that of national income. The result was that the elasticities during 1966 and 1967 were 3.10 and 2.20 respectively. The available information for 1968 and 1969 indicates that the tax elasticity has remained higher than one. It is necessary then to change the coefficients of Equation 3.54 of Chapter III. Thus Equation 3.54 was reestimated using data of the 1965-67 period with the following results:

$$T_{pi} = -7558 + .0819\ NI \quad .$$

The new equation implies that the marginal propensity is now higher than the average rate, indicating that the changes in tax policy were in the right direction.

Table 4.4 presents the predicted values of the major endogenous variable for the 1966-1969 period and compares them with the observed ones. The values of the observed exogenous variables for 1966 and 1967 were taken from the U.N. National Accounts Book (36).

The model predicts fairly well for 1966 but it does not capture the recession of 1967 which was caused by noneconomic factors.

The predictions of investment expenditure for 1967 are unsatisfactory. In the case of manufacturing and housing capital expenditures, there was an absolute decline in the observed values in 1967, while the model shows a very slow rise for industrial investment (0.75 percent over the 1966 value) and a high increase for housing investments. However, the prediction of imports of goods is very good for both 1966 and 1967.

For sectoral output, the manufacturing sector's prediction is satisfactory for both 1966 and 1967, while for the agriculture sector the predicted value for 1967 is significantly higher than the actual one.

Fairly accurate also was the predicted price change (P) for 1966 and for 1967.

Table 4.4. Observed and predicted values for some of the endogenous variables for 1966 and 1967 (in thousand of mil. dollars at 1960 prices)

	$\hat{X}$	X	$\hat{C}$	C	$\hat{M}_G$	M_G
1966	141564	140782	125921	122549	34841	34470
1967	151052	146533	132582	130742	35338	34500
	$\hat{XMA}$	XMA	$\hat{XAM}$	XAM	$\hat{IMA}$	IMA
1966	26142	26012	33879	32245	5355	4666
1967	28024	26709	35052	33692	5500	4083
	$\hat{IH}$	IH	$\hat{T}_{ind}$	T_{ind}	$\hat{T}_{pi}$	T_{pi}
1966	12070	12533	26605	27700	5798	5600
1967	13373	11818	28015	30700	6680	6400

Finally, it seems that the performance of the model in 1968 is very close to the observed one. In particular, the predicted GDP growth rate for 1968 is 5.00 percent which compared very favorably with the actual one of 4.50 percent. Thus, the performance of the model outside the sample period reinforces the conclusions reached in the first section of this chapter; that the econometric system could be used with some degree of confidence for making short-term projections.

CHAPTER V SHORT TERM PROJECTIONS: 1969-1972

The predictive ability of the model, both within and outside the sample period, was satisfactory in permitting one to extrapolate with some degree of confidence the values of the major endogenous variables for 1969-1972. However, to make these projections it is first necessary to forecast the values of the exogenous variables. Thus any error in the projections of the exogenous variables will increase the error that arises from the model itself. In this respect the results of the short term projections will depend not only on the reliability of the model proper but also on the forecasts of the exogenous variables. To examine what impact different values of the exogenous variables have on the endogenous variables, alternative projections for exports of goods and services and government expenditures have been made. In this way the sensitivity of the model and its logical consistency are also investigated.

The Forecasts of the Exogenous Variables

Export projections

Export earnings will be one of the most crucial determinants of the potential growth rate of the Greek economy. The substantial gap that exists in the balance of trade and the critical foreign indebtedness of the Greek economy, plus

the uncertainty about the future direction of invisible earnings leaves only one alternative: a continuous high rate of growth for merchandise exports. Given that the present structure of exports is very unfavorable for continuous export growth there is also the need for drastic changes in export composition. Such changes, of course, will come about only if the production pattern of the Greek economy is also altered.

The export forecasts were based on past trends, world demand, domestic supply and projections made by the World Bank (10). For most of the major commodity groups and for the services two alternative growth rates were projected. The forecasts are shown in Tables 5.1 and 5.2.

Current government expenditures

During the 1960-66 period the authorities used government expenditures to meet the needs of a growing economy rather than as a direct stimulus to economic development. In 1967 and 1968 because of the slowdown in economic activity, current government expenditures were substantially increased. The annual average rate of increase of C_g for 1960-66 was approximately 10 percent while for 1966-68 it was estimated at around 20 percent. It will be almost impossible for the authorities to maintain such a high rate of growth of C_g without running into serious fiscal problems.

Table 5.1. Projections of export of goods for 1968-1972 (in m. drachma)

		1960	1967	1968	1969	1970	1971	1972	Projected rate of growth 1968-1973	Actual rates of growth 1960-1967
Raisins	1[a]	819	1116	1132	1149	1167	1184	1202	1.5	4.5
	2[b]			1198	1161	1184	1208	1232	2.0	
Olives & Olive Oil	1	342	769	819	872	929	986	753	6.5	12.3
	2			830	897	969	1046	1130	8.0	
Tobacco	1	2181	3748	3786	3823	3862	3900	3939	1.0	8.1
	2			3823	3900	3978	4057	4138	2.0	
Cotton	1	576	1071	1125	1181	1240	1302	1367	5.0	9.3
	2			1178	1296	1426	1568	1725	10.0	
Citrus Fruits	1	210	495	544	599	659	725	797	10.0	13.10
	2			569	655	753	866	996	15.0	
Other Fresh Fruits and Vegetables	1	110	684	752	827	910	1001	1101	10.0	Very high
	2			786	904	1040	1196	1375	15.0	
Preserved Fruits and Vegetables	1	147	465	511	562	618	680	748	10.0	Very high
	2			534	614	707	813	935	15.0	

[a] 1 low rate of growth.

[b] 2 high rate of growth.

Table 5.1 (Continued)

		1960	1967	1968	1969	1970	1971	1972	Projected rate of growth 1968-1973	Actual rates of growth 1960-1967
Wine and Beverages	1	66	273	300	330	363	399	439	10.0	22.0
	2			314	361	415	477	549	15.0	
Wheat	1		571	577	583	588	594	600	1.0	
	2		--	--	--	--	--	--	--	--
Hides and Skins	1	282	302	317	333	350	367	386	5.0	1.0
	2			326	352	381	411	444	8.0	
Other Agri.	1	30	75	82	90	99	109	120	10.0	15.0
	2		--	--	--	--	--	--	--	--
Mineral and Ores	1	540	737	774	813	854	896	941	5.0	4.6
	2			811	892	982	1080	1188	10.0	
Manufactured Products	1	636	2883	3171	3489	3837	4221	4143	10.0	24.0
	2			3316	3813	4385	5043	5799	15.0	
Miscellaneous	1	318	382	420	462	508	559	615	10.0	2.8
	2	--	--	--	--	--	--	--	--	--
Total	1	6257	13578	14310	15113	15984	16923	17960	6.0	11.7
	2			14764	15980	17415	19027	20853	9.0	

Table 5.2. Projections of invisible receipts for 1969-1972 (in m. drachma)

		1960	1966[a]	1968[a]	1969	1970	1971	1972	Projected growth 1967-1972	Actual growth 1960-1966
Tourist Receipts	1[b]	1479	4302	3840	4224	4646	5622	6184	12.0	19.5
	2[c]				4416	5078	5840	6716	15.0	
Emigrant Remittances	1	2790	7050	7220	7436	7659	7889	8126	3.0	16.7
	2				7581	7960	8358	8775	5.0	
Shipping Remittances	1	2295	5457	7290	8237	9308	10518	11886	13.0	15.50
	2				8459	9809	11378	13199	16.0	
Miscellaneous		1641	2250	3024	3325	3656	4024	4427	10.0	5.40
Total	1	8205	19059	21374	23223	25272	28053	30623	9.50	15.00
	2				23782	26506	29600	33117	11.50	

[a]1966 and 1968 have been used for calculating the growth rates due to the sharp decline of receipts.

[b]1 low estimate.

[c]2 high estimate.

At the same time it seems that the authorities may have to maintain a higher rate than the one of 1960-66, both for political and economic reasons. The highest possible rate of change of C_g will depend on maintaining at least a balanced budget, and also on what share of government capital expenditure is to be financed from current surplus. Thus C_g should be at least

$$C_g \leq T_{ind} + T_{sc} - T_{rg} \quad . \tag{5.1}$$

The two growth rates that are assumed here are the historic one of 10.0 percent (for 1960-66) and a higher one of 12.0 percent. The two rates imply a different solution for Equation 5.1 thus permitting the examination of the extent to which they are feasible.

Import price index (P_m)

Reliable projections of import prices of goods, although very important since they enter directly in the estimation of capital inflow, are very difficult to determine. This is due not only to the fact that the import prices reflect price changes at countries of origin, but also to the extent that import shares by country of origin have been changing over time. Such projections would require a major study of their own. What was done here was to assume that the overall price index of imported goods will remain at

the 1967 level.

The remaining exogenous variables IOR, P, P_{IOM} were projected by time trends. In particular St_{in} was assumed to decline over the 1969-72 period as a result of the explicit policy of the government to reduce the use of the inefficient subsidy system for protecting agricultural income.

Projections for the 1968-1972 Period and for the Major Macro-Economic Variables

First, projections based on the high growth rate of exports (E) and governmental expenditures (C_g) are presented and discussed; this is followed by the case of a slow growth rate of E and C_g. Finally projections based on "low" C_g and "high" E are discussed.

The discussion will center on the BOP problem, sectoral growth, inflationary pressures and government current revenue and expenditures.

Projections based on high growth rate of E and C_g

The "high" projections are based on a growth rate of exports of goods of 9.00 percent and government current expenditures of 12.00 percent.

Table 5.3 indicates that the resulting 7.2 percent annual growth rate of GDP may not be possible to attain

Table 5.3. Projections of the major endogenous variables for 1970-1972 based on 9.0 percent and 12.0 percent rate of growth of exports and current government expenditures respectively (in m. drachma)

	1967	1970	1971	1972	Annual growth rate 1967-1972	Annual growth rate 1961-1966
GDP	151052	183107	197635	213746	7.2	6.7
Investment	40042	50049	54795	59996	8.3	12.4
Merchandise Imports	35338	45086	50581	55875	9.5	9.2
Manufacturing Sector	28024	32575	34888	37433	6.0	9.2
Agricultural Sector	35158	39906	42330	44989	5.0	5.5
					Average 1970-1972	Average 1961-1966
Foreign Capital Inflow (net)		8860	9665	10433	9652	4229

because of the high foreign capital inflow (F) requirement. The average value of F for 1970-72, 9652 mil drchm, ($320m), falls outside the limits of the Five Year Plan which had assumed a F of 9,000 mil drchm ($300m). In addition it must be remembered that the price level of imports has been assumed to remain at the 1967 level. Even if P_m does not vary from its 1967 value there are still doubts that Greece

can obtain such a level of net capital inflow. It will seem that the projected growth rate for 1970-72 (which is the same as the Five Year Plan) is possible only if imports are curtailed, either through import substitution or through selective import constraints. Otherwise it is apparent that the country will be faced with a severe BOP problem and/or slow growth of GDP.

The present situation in the BOP reinforces the previously stated pessimism since the deficit in the current account was in 1969 over 9,000 mil drchm ($300m) (which is close to that projected here 7786 mil drchm in 1967 prices). To finance this deficit the required capital inflow was found from the following sources: 3750 mil drchm ($125m) were extraordinary borrowing to cover the expected deficit (i.e., short-term borrowing at rather high interest); 1200 mil drchm ($40m) were official and banking loans; around 1800 mil drchm ($60m) were short-term and medium-term supplier credits; and only 5100 mil drchm ($170m) were private foreign capital inflow. Thus at least fifty percent of the capital inflow for 1969 will have to be repaid soon with high service charges.[1]

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[1]In particular the estimated total outstanding supplier credits at the end of 1969 were in the region of 13500 mil drchm ($450m). In comparison the combining foreign exchange reserves of the Central Bank and Greece's IMF facilities are 15900 mil drchm ($520m).

It does not appear that Greece can withstand the BOP pressures without a substantial increase in foreign capital investment, which during the 1967-1969 period averaged about 6000 mil drchm ($200m).

The next test is to examine if the constraint that was imposed on current government expenditures (Equation 5.1) is satisfied. For the first year, 1970, the constraint is barely met, and for 1971 and 1972 there is a small deficit. In other words the continuation of the 12.0 percent annual growth of public expenditures will result in a deficit in the government accounts, which will have an upward impact on the price level. The structure of the model does not permit the incorporation of the influence of the government deficit on the rest of the variables and for this reason it can only be concluded that the 7.2 percent growth rate may imply a higher rise in the price level than the one percent which is predicted here.

The growth rate of the manufacturing sector for 1970-1972 is projected at 7.30 percent per year. This is substantially lower than the 11.0 percent that is anticipated by the authorities. On the other hand the present solution indicates that the sector will operate at 88 percent capacity. Thus it could be argued that the output of the industrial sector could be increased by an increase in effective demand. It seems nevertheless that in order to predict

manufacturing output more accurately, the estimated input-output identity should be adjusted so that it includes the final demand components that represent the fastest growing activities of the manufacturing sector. At the present time the dynamic industries of the sector are those that manufacture for exports, for more advanced consumer goods, and in some lines of capital goods.

The agricultural sector presents exactly the opposite picture. Domestic demand (which may be overestimated) will by 1972 result in excess demand. The implication here is that domestic capacity cannot increase at a high enough rate given the past trends of capital expenditures in the sector. Since the agricultural problem is one of output distribution on the subsector level the present results should be taken with caution.

It becomes apparent from the discussion on the projections of sectoral output that there is a need for an analysis on the sectoral level, in order to evaluate the actual potential for growth of the Greek economy. For the short-run, nevertheless, the results of the present projection indicate the possible bottlenecks that may arise.

Projections based on low growth rate of both C_g and E

The results of Table 4.3 make it apparent that a growth rate of exports at less than 9.00 percent for 1970-1972

Table 5.4. Projections of the major endogenous variables for 1970-1972 based on 6.0 percent and 10.00 percent rate of growth of exports and current government expenditures respectively (in mil drchm)

	1967	1970	1971	1972	Annual growth rate 1967-1972	Annual growth rate 1961-1966
GDP	151052	180749	194009	208885	6.7	6.7
Investment	40042	49837	54349	59353	8.2	12.4
Merchandise Import	35338	44262	48493	52891	8.4	9.7
Manufacturing Sector	28024	31787	33642	35744	5.0	9.2
Agricultural Sector	53158	39018	40990	43208	4.2	5.5
					Average 1970-1972	Average 1961-1966
Foreign Capital Inflow (net)		9696	10786	12240	10908	4224

will create a severe bottleneck in the BOP. For the "low" projection, although the growth rate of GDP and import of goods drops to 6.7 and 8.4 percent respectively in comparison with 7.2 and 9.7 from the "high" projections, the required F increases considerably from the previous figure reading to 10907 mil drchm ($363) which will seem to be clearly above the borrowing capacity of the country.

The "high" and "low" projections imply that while capacity output can increase with the same growth rate as the historical one, actual output will depend on effective demand. A high growth rate of current government expenditure, of the 12.0 percent order, may cause a government deficit. On the other hand, a high growth rate of exports may permit the elimination of an external bottleneck. If C_g and E grow at a low rate the problems are multiplied since both the government deficit and the BOP problems become acute. It is then desirable to examine the implications of exports' increasing at the high rate while government expenditure increase at a low one. In this respect BOP problems may not be very strong, while the government sector may show a surplus since overall activity is high while public expenditures will grow at a low rate. The key problem is whether the desirable rate of growth of exports can be met.

Projections based on the 10.00 percent growth rate of C_g and 9.00 percent of E

The most important characteristic of the present set of projections is that the capital inflow that is required is relatively lower than the two previous results despite the fact that the GDP growth rate is .10 percent (see Table 5.5). Furthermore, the government accounts show a surplus throughout the 1969-1972 period. It can be argued that if

Table 5.5. Projections of the major endogenous variables for 1970-72 based on a 9.00 percent and 10.00 percent rate of growth of exports and current government expenditures, respectively (in mil drchm)

	1967	1970	1971	1972	Annual growth rate 1967-1972	Annual growth rate 1961-1966
GDP	151052	181944	195782	211435	7.10	6.70
Investment	40042	49906	54584	49672	8.40	12.40
Merchandise Imports	35338	45262	49709	54756	9.20	9.70
Manufacturing Sector	28024	32181	34254	36623	5.60	9.20
Agricultural Sector	35158	39475	41643	44149	4.60	5.50
					Average 1967-1972	Average 1961-1966
Foreign Capital Inflow (net)		7170	8560	9020	8585	4224

the growth rate of current government expenditures is rising at a slower pace than the one of 1966-68 and, in addition, if exports of goods could rise at around 9.00 percent, then a 7.00 percent growth rate could be possible. It is important nevertheless to realize that the required capital outflow for capital amortization and interest payments could be very high in the next two years, adding to the external

burdens. Furthermore, any rise in the price of imported goods could create additional problems.

The most undesirable feature of the present solution is the low growth rate that is projected for the manufacturing sector for 1967-1972, which partly reflects the slowdown of 1967 and 1968 (for 1972 its growth is projected at 7 percent). The fact that there is unused capacity indicates once more that Equation 3.33 of Chapter III, which determines output is not the appropriate one due to the fact that it does not include those final demand components which account for the present growth of the sector. If demand output of the manufacturing sector increases more than the one projected here, this will imply a higher growth rate for GDP. On the other hand, the impact of the higher growth of XMA on the BOP will depend very much on what lines of production the increase will take place. It is possible that additional manufacturing output could be forthcoming with a lessening in the pressure of the BOP if it takes place in import substitution and industrial exports. Since the model does not incorporate this relationship, it is apparent that only a qualitative answer can be given.

Projections based on a higher rate of growth of the manufacturing sector

The system was solved once more by making a crucial change. It was assumed that the rate of growth of the manufacturing sector is determined by its production function (Equation 3.28 of Chapter III). Thus it is implied that demand will absorb all potential output and there will be no unused capacity.

The results of this solution (Table 5.6) indicates an acceleration in the GDP's and manufacturing sector's rate of growth. In particular the growth rate of the manufacturing sector is 10 percent for the 1967-1972 period (11.5 percent for 1969-1972), which is consistent with five year plan (1968-1972) and the one recorded for 1969. At the same time the level of imports and the resulting foreign capital inflow also rise very sharply. The average F for the 1970-1972 period is approximately 12000 mil drchm ($400m) and although very high, may underestimate the actual requirements if present trends continue. During 1968 the model predicts a deficit of 7590 mil drchm ($253m) while the actual was 7650 mil drchm ($225m). Finally in 1969 the projection made by the model was for 9720 mil drchm ($324m) while the Bank of Greece recorded 10690 mil drchm ($353m) (the 870 mil drchm ($29m) difference is not that much if one considers that the projections have been made on the basis

Table 5.6. Projections of the major endogenous variables for 1970-1972 as in Table 5.5 but assuming an acceleration in the growth of the manufacturing sector (in mil drchm)

	1967	1970	1971	1972	Annual growth rate 1967-1972	Annual growth rate 1961-1966
GDP	151052	189077	204956	233123	8.00	6.70
Investment	40042	52785	58145	63892	10.00	12.40
Merchandise Imports	35338	47971	53228	59235	11.00	9.70
Manufacturing Sector	28808	37985	41922	46366	10.00	9.20
Agricultural Sector	35158	38733	40477	42683	4.00	5.50
					Average 1970-1972	Average 1961-1966
Foreign Capital Inflow (net)		10746	11851	13178	11928	4224

of import prices with 1967 as the base year). Thus the sharp upward trend between 1968 and 1969 and the rising prices in the world market make the predicted average for the 1970-1972 period not very unlikely.

In the light of these developments the authorities have introduced a number of nontariff barriers to slow down the rate of imports. As a result, during the early months of 1970 imports increased by 11 percent (the same rate that is

predicted here) compared with 15.0 percent for all of 1969 that was reported by the Bank of Greece and projected by the model.

On the other hand exports showed a spectacular increase of about 42 percent during the first two months of 1970. It is doubtful that this high rate will be maintained but it is possible that the deficit in the balance of trade may be lower in 1970 than in 1969. Despite this improvement the economy will be faced with an increasing need for foreign exchange in order to meet interest and amortization payments on the foreign debt. Furthermore, the earnings on foreign private investment will show an increase and this will imply higher capital repatriation payments. Once more it becomes apparent that Greece's balance of payment problem is there to stay. Under these circumstances it is difficult to see how the authorities can avoid either a devaluation of the Greek drachma, or some further import restrictions. Nevertheless, some of the imports could be curtailed by increasing domestic production. For example, the import of foodstuffs which was close to 16.0 percent of total imports during 1969 could be drastically reduced if the animal breeding subsector of the agricultural sector is able to increase its output to the level of domestic demand.

The sectoral structure seems to be improving. For example, for 1972 the present solution of the model predicts

that 19.0 percent of GDP will be contributed by agricultural and mining sectors compared with 24.0 percent in 1965. The manufacturing sector's contribution will rise from 18.0 percent in 1965 to 21.0 percent by 1972. As can be recalled from Chapter III, the share targets consistent with the Chenery norm were 18.0 for the primary sector and 25.0 percent for the manufacturing one. The growth of the manufacturing sector that is projected here is around 11 percent, which is slightly lower than the 12.0 percent that is required to increase the share of the sector's total output to 25.0 percent. The slowdown in the growth rate was, of course, due to the 1967 and 1968 recession, but since then industrial output has been increasing close to 12 percent. There might be a problem during 1970 and 1971 that could cause a slowdown in manufacturing growth. Investment in housing construction which still remains the most important part of total investment, has been slowing down during the early months of 1970. The feeling is that the housing dwelling market is becoming a tenant's instead of a landlord's market. If demand for dwellings declines then one of the most important branches of the manufacturing sector, the building industries, may go through a slump which will affect the sector's growth rate.

The second constraint to growth could then be the undesirable allocation of capital expenditures to the

productive sectors. Investment in housing construction still takes the largest share of the nation's productive resources, and fluctuations in the output of the sector are strongly felt in the rest of the economy.

It is apparent that a number of very important questions cannot be answered by the present model; in particular, the possibility that there may exist sectoral constraints. The only way to investigate such a problem is with an input-output model.

The outline of such a study could be as follows. Given the final demand for consumption and exports from the econometric model, one can determine final demand for each sector with the help of income elasticities (for consumption expenditures). In addition, import to gross output ratios and sectoral capital-output ratios are also needed. The final demand sector thus determined, it would be possible to estimate gross output for each sector. The level of gross output is not consistent with the consumption and export needs of the econometric model. Using the import-output and capital-output ratios, the required investment and imports (from input-output point of view) could be determined and compared with the ones of the macro-model. Through iteration any discrepancy between the two results would be eliminated and sectoral consistency would be achieved.

The absence of a recent input-output table, as well as of sectoral capital output ratios, did not permit the expansion of the work. Thus the results that were presented here should be viewed with caution since their implications on the sectoral level were not taken into consideration.

CONCLUDING REMARKS

The present study has attempted to investigate the evolution of the Greek economy over the last twenty years and its future prospects. Chapters I and II dealt mainly with the performance of the Greek economy during the 1953-1966 period, and the rest of the study was devoted to making short run projections, on the basis of an econometric model, for the major economic variables.

The main findings of Chapters I and II will first be briefly summarized. The Greek economy was found to have experienced a sustained development throughout the period under review. At the same time the deficit in BOP had also increased from $24.8m in 1953 to $264.1m in 1966. The discussion attempted to show that the rise in the external gap was caused by the sectoral composition of GDP. The observed ratio of manufacturing output to total output in 1965 was significantly lower than the one that was calculated from Chenery's sectoral growth equation. In other words, on the basis of the 1965 Greek per capita income and population, the industrial production was lower than what international norms would have anticipated. One explanation for this pattern of development seems to be the sectoral allocation of capital expenditures. During the 1953-1965 period industrial capital amounted to only 11.0 percent of the total

investment in comparison with the 40.0 percent that was directed to the housing sector. Thus, one of the issues that Greece will be facing in the next few years is that there must be a change in the pattern of sectoral allocation of capital expenditures. In particular, a larger portion of the total resources must be directed to the manufacturing sector than in the past. It is felt that a further rise in the per capita income without a higher proportionate increase in the per capita manufacturing output will probably act as a constraint to long run economic growth. The absence from Greece of large quantities of raw material requires that industrial production should provide both the stimulus to growth and the main source for foreign exchange earnings, either through exports and or import substitution.

The first problem that was examined was what the sectoral composition of GDP would be by 1972, if GDP was to grow by 7.0 percent per annum and if the sectoral growth trends during 1965-1972 were to be the same as those in the 1960-1965 period. The estimates showed that there will be a further departure from the international norm. For example, the forecasted ratio of manufacturing output to GDP in 1972 was 20.6 percent while the same ratio calculated from the sectoral growth equations was 29.0 percent.

The next step was to estimate sectoral growth rates that are consistent with a desirable sectoral composition of

GDP. (The structure of production was postulated on an ad hoc basis taking into consideration that the main objective is an increase in the share of industrial output to total output and also that there is output interdependencies between the sectors.) Thus, for a 25.0 percent ratio of industrial to total GDP, the output of the sector should have increased by 12.0 percent per annum in the 1965-1972 period--a considerably higher growth rate than the one in 1960-1965. In this exercise the capital and foreign exchange requirements that are needed to meet the target growth rates were not estimated. Instead, the feasibility of the desired changes in the structure of production, from the point of view of resource availability, was tested through the use of the econometric model that was presented in Chapter III. (The discussion that follows is based on Table 5.3 of Chapter V.)

The projections of Chapter V, which were based on two alternative assumptions for most of the major exogenous variables, showed that the GDP could grow at the rate of 7.2 percent for the 1967-1972 period, but at the same time indicated that the deficit in the BOP would be increasing. It must be noted, however, that exports were exogenously projected and, as a result, there is no relationship between manufacturing production and exports of industrial goods. On the other hand, imports were endogenously

estimated and, in addition, import substitution was incorporated, first through the negative sign of the constant variable in most of the import functions (implying that import elasticity is less than one), and second by a dummy variable. For this reason the external deficit that is projected by the model may have been overestimated by the amount that the exports have been underestimated. The important point, however, is that the required rate of growth of imports of goods was in constant prices for a 7.2 percent growth of GDP for the 1967-1972 period was 9.5 percent. If payment for services is taken into account, together with a rise in the price of imported goods, the overall rate of growth of external payments on current accounts comes to around 15.0 percent per annum. It is very improbable that exports of goods and services could expand at a sufficiently high rate so as to reduce the external deficit. Greece then would be faced for the next few years with a continuous deterioration in its external accounts.

The persistent deficit in the BOP indicates that the Greek drachma is overvalued, but authorities do not seem to be interested in doing the obvious, which is to devalue. An alternative policy measure would be to introduce higher

tariffs for certain commodities[1] and thereby restrict the total import bill to a desirable minimum. The impact of such a policy on the Greek economy was tested by the model,[2] and it was discovered that under such conditions there would be a significant increase in the price level. The inflation was caused both by a shortage of commodities, imposed by the reduction in imports and by the maintenance of the total expenditures at the same level. The inflationary pressures could be reduced by an increase in the tax rate which would decrease the level of effective demand. Even if tax rates remain at the same level, a policy of import restriction could have a positive impact on the economy because, if properly implemented, it would accelerate the development of the industrial sector by diverting demand from the external to the domestic market.

On the other hand, devaluation may also cause a rise in the domestic price level, but the import structure, which depends on income distribution, may not change. In addition,

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[1]The authorities have, as of late 1970, extended the number of commodities that are affected by nontariff barriers. One of the key features of these measures is the advance deposit with the Central Bank of an amount equal to twice the value of the imported commodities.

[2]It was assumed that total imports could not exceed the sum of projected export earnings plus a net foreign capital inflow of $300m in 1972.

industrial exports would be affected both directly by a reduction in their relative prices (positively) and indirectly by an increase in their cost of production, through import costs (negatively). It would seem that a combination of the two policies may be the appropriate measure.

Implicit in the projection of Table 3.3, Chapter V, is that the sectoral composition of GDP for 1972 will not be different from what was forecasted on the basis of Chenery's equations in Chapter II. It may be recalled that the manufacturing share of total GDP was 20.5 percent based on a 7.0 percent growth rate for GDP. For this reason an alternative set of projections was estimated (Table 5.6, Chapter V) by permitting an acceleration in the rate of growth of manufacturing output from 6.0 percent per annum to 10.0 percent. The main constraint in achieving this target will be the deficit in the BOP which will now reach the value of $440.0m by 1972. The experience of the last four years (1967-1971) has been that the authorities are willing to borrow in the foreign markets at excessive rates in order to cover the deficit, thus permitting the economy to expand at the maximum growth rate.

It is possible then that in the short run the system could operate without major problems. If this indeed takes place, there will be a slight improvement in the sectoral composition of GDP. The share of manufacturing output to

total output would rise to 21.0 percent by 1972. This, nevertheless, is considerably less than the 25.0 percent that was postulated in Chapter II.[1]

However, it will be difficult for the present trend to continue for a long time without creating a crisis in the BOP. The rapid increase in the per capita income, now close to 7.00 percent per annum, would be translated into demands for commodities that the domestic market cannot provide. Imports of goods in constant prices have been projected to rise by 11.0 percent in the 1967-1972 period with an implied import elasticity with respect to GDP of 1.35. On top of that, payment of the foreign debts will be increasing at an accelerated pace from 1972 on, because of the short-term borrowing of the last four years. On the other hand, the future for exports of goods, despite their recent growth, does not look promising.

The Greek authorities believe, however, that foreign exchange earnings from other industrial commodities and from invisible receipts will continue to expand at such a rate as to make it possible to reduce the external deficit. Such a development is probable only if foreign exchange earnings can

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[1]It is important to note that the rate of growth of GDP is projected at 8.00 percent, which is higher than the one assumed for the projections of Chapter II. One reason for the small increase in the share of industrial output to total output is the stagnation that the sector experienced in 1967 and 1968.

increase by approximately 15.0 percent per annum for the next few years, an increase which seems impossible.

Under present circumstances Greek policy makers should concentrate their efforts on increasing the output of the industrial sector. Since this would demand imports of capital goods and raw material, restrictions on the importation of consumer goods should be introduced. A policy mix of devaluation, tariffs and fiscal measures should help to reduce unnecessary imports. Devaluation would bring the drachma to a more realistic level in respect to the dollar and at the same time would reduce the relative prices of Greek exports. Tariffs on consumer goods would permit the saving of foreign exchange that may be used to import capital goods and raw material.

Finally, the tax policy should aim at an income redistribution that will favor the low income groups, which usually have a low marginal propensity to import. In addition, it should also permit an increase in the share of public investment relative to private investment. It seems that a constant rise in governmental capital expenditures would be required for an improvement in the sectoral composition of GDP. The investment structure that is implied by the projections of Table 5.6 of Chapter V indicates that the industrial sector will require 14.5 percent of the total investment in 1972 if it is to attain a 21.0 percent share

of the total GDP. In the past attempts to direct capital expenditures to the manufacturing sector through a combination of fiscal and monetary policies were not very successful. According to Professor Zolotas, "It is widely recognized, however, that tax and duty discounts and exemptions, larger depreciation allowances, credit facilities, the simplification of controls, have so far been of limited effect" (25, p. 204).

The private investor is attracted by projects with a high market rate of return which (rate of return) may not be consistent with the social rate of return; and, as was already mentioned, available evidence indicates that fiscal and monetary measures do not seem to equate the two rates. Thus, if industrial development is socially desirable and if the private investor is not willing to invest in the sector, the government should do the job. It would seem that the desirable policy would be to increase the rate of taxation of profits considerably and to proceed, in some cases, with a nationalization of certain industries, and then in turn to use the increase in public revenue to invest in the manufacturing sector. Such a policy should be accompanied by a consistent program of industrial projects which (projects) should take into account the deficit in BOP (as well as the elimination of unemployment). A combination of a policy of import constraints and government investment in

the manufacturing sector should permit a decline in the external deficit and at the same time allow for an acceleration in the rate of growth of industrial output.

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APPENDIX

Macroeconomic data 1954-1965 (in million of drachma)

	NI	YDF[a]	X[a]	XAM[a]	XMA[a]	XOM[a]
1954	53777	62619	69037	21117	9930	8108
1955	61957	67372	73711	22605	10886	8986
1956	72380	74244	78185	23321	12047	9893
1957	77507	78800	84157	26324	12869	10010
1958	79882	81718	86321	24471	13962	11582
1959	82785	85301	90012	25653	14254	12843
1960	88410	88270	92465	23808	15683	14161
1961	100296	98663	102445	28965	16790	15565
1962	105541	102852	105078	26997	17703	16809
1963	116656	114579	113229	29079	19635	18198
1964	129946	125210	122884	30993	21523	20333
1965	145248	137252	131828	32715	23455	22522

	XH[a]	XOR[a]	XROR[a]	KAM[a]	KMA[a]	KOM[a]
1954	7519	22335	46702	6552	9320	10643
1955	7818	23377	50334	7586	10619	12998
1956	8162	24710	53475	9034	12211	16201
1957	8501	25916	58241	11195	14138	19131
1958	8844	27399	58922	14024	16491	23294
1959	9221	28003	62009	17037	18624	27958
1960	9598	29215	63250	20633	20687	33237
1961	10109	30918	71527	24429	23219	38938
1962	10598	32906	72172	27983	26093	45470
1963	11154	35080	78149	31989	28969	51464
1964	11806	38142	84742	36246	32440	59547
1965	12578	41250	70578	40844	37080	68447

[a]In 1960 prices. All others in current prices.

Macroeconomic data (Continued)

	KH^a	C_{PAM}	C_{PMA}	$C_A{}^a$	$C_B{}^a$	$C_F{}^a$
1954	17797	0.827	0.911	33043	6377	10151
1955	22649	0.877	0.946	34701	7254	10452
1956	28034	0.897	0.988	36074	7531	11109
1957	32672	1.000	0.989	37685	8206	11672
1958	38495	0.912	1.000	38270	8557	12204
1959	43978	0.934	0.936	38986	8470	12469
1960	49896	0.846	0.960	39583	9564	13118
1961	56699	1.000	0.964	42454	10500	13827
1962	64468	0.905	0.945	43013	11601	14762
1963	73421	0.949	0.971	45386	12282	15662
1964	84226	0.982	0.991	47703	14140	16519
1965	96385	1.000	1.000	49585	15704	17916

	$C_D{}^a$	$C_E{}^a$	$I_{AM}{}^a$	$I_{MA}{}^a$	$I_H{}^a$	$I_{OM}{}^a$
1954	1645	12314	961.0	1192.0	4199.0	2114
1955	2102	12380	1034.0	1299.0	4852	2355
1956	2292	14457	1448.0	1592.0	5385	3203
1957	2682	15290	2061.0	1927.0	4638	2930
1958	2976	16165	2859.0	2353.0	5823	4163
1959	2779	16724	3013.0	2133.0	5483	4663
1960	3141	1797.6	3596.0	2063.0	5918	5279
1961	3419	18756	3798.0	2532.0	6803	5701
1962	3859	20467	3554.0	2874.0	7769	6532
1963	4210	22747	4006.0	2876.0	8953	6994
1964	4794	26052	4257.0	3471.0	10805	8083
1965	5071	28850	4598.0	4640.0	12195	8900

Macroeconomic data (Continued)

	D	STAM[a]	STMA current	M_1[a]	M_2[a]	M_3[a]
1954	3233	-590	-668	1565	1405	1216
1955	3493	1488	-187	2217	1402	1310
1956	3874	716	1549	3313	1469	1254
1957	4180	3003	1860	2897	1830	1307
1958	4532	-1853	937	2820	1790	1481
1959	5199	1182	-126	2425	1564	1268
1960	6069	-1845	-759	2290	1966	1574
1961	6664	5157	703	3192	1919	1644
1962	7529	-1968	2345	2871	2056	1743
1963	7906	2082	1383	3505	2602	2197
1964	9204	1914	6222	3459	2668	1924
1965	10051	1722	4887	4714	3419	3015

	M_4[a]	M_5[a]	M_6[a]	M_7[a]	M_S	E
1954	779	1967	655	1649	1470	6227
1955	752	1888	751	2297	1616	8220
1956	862	2030	925	2358	2343	8509
1957	1115	2360	1085	2738	2161	9861
1958	1594	2626	1284	3660	2004	9961
1959	1504	2516	1347	3229	1963	9436
1960	1627	2746	1517	3884	2211	9640
1961	1739	2985	1625	4550	2545	10788
1962	2181	3269	1973	5190	2936	11953
1963	2845	3842	1902	5847	3328	14111
1964	2938	4463	2223	7289	3460	14473
1965	3236	5418	2541	8623	4251	16122

Macroeconomic data (Continued)

	TRF	Y_f	P_A	P_B	P_F	P_D
1954	1410	873	0.829	0.795	0.779	0.972
1955	1520	938	0.857	0.846	0.872	0.986
1956	1827	1521	0.936	0.937	0.900	1.008
1957	2248	2099	0.939	0.940	0.927	0.988
1958	2299	1459	0.966	0.973	0.953	0.976
1959	2658	1536	0.987	0.997	0.976	0.999
1960	2716	2014	1.000	1.000	1.000	1.000
1961	3224	2384	1.016	0.991	1.014	1.016
1962	4173	2601	1.027	0.982	1.033	1.000
1963	5044	2942	1.080	0.990	1.056	1.002
1964	5305	3350	1.092	1.000	1.075	0.991
1965	6208	3630	1.178	1.013	1.087	0.999

	P_E	P_C	P_{IAM}	P_{IMA}	P_{IOM}	P_{IH}
1954	0.820	0.778	0.822	0.777	0.860	0.806
1955	0.959	0.872	0.862	0.806	0.838	0.893
1956	0.916	0.899	0.872	0.868	0.813	0.924
1957	0.935	0.926	0.888	0.876	0.859	0.975
1958	0.957	0.953	0.915	0.857	0.885	0.974
1959	0.978	0.976	0.919	0.959	0.918	0.985
1960	1.000	1.000	1.000	1.000	1.000	1.000
1961	1.014	1.014	1.012	1.034	0.997	0.997
1962	1.020	1.033	1.032	1.160	0.688	1.007
1963	1.009	1.056	1.034	1.164	1.124	1.007
1964	0.964	1.075	1.095	1.229	1.133	1.042
1965	0.950	1.086	1.121	1.221	1.174	1.074

Macroeconomic data (Continued)

	P_{IOR}	P_M	P_{AM}	P_{MA}	T_{ind}	T_{pi}
1954	0.818	1.052	0.848	0.864	5811	2330
1955	0.879	1.057	0.902	0.934	6920	2472
1956	0.911	1.107	1.000	0.991	7994	2870
1957	0.947	1.129	0.954	0.985	9015	3194
1958	0.960	1.035	0.975	0.984	10113	3213
1959	0.961	1.028	0.926	1.006	10394	2929
1960	1.000	1.000	1.000	1.000	11310	3037
1961	1.006	0.982	1.026	1.005	13282	3422
1962	1.015	0.973	1.090	1.018	14828	3577
1963	1.032	0.972	1.127	1.013	17159	3725
1964	1.083	1.004	1.171	1.020	19848	4378
1965	1.120	1.017	1.256	1.044	22993	4330

	T_{sc}	T_{rg}	Y_g	I_g	C_g	S_{ub}
1954	1891	2762	382	49	7135	97
1955	2515	3335	370	76	7812	184
1956	2886	3807	489	71	9649	127
1957	3298	4219	656	51	9733	264
1958	3510	4735	555	53	10134	375
1959	4017	5077	952	171	10857	543
1960	4613	5622	1114	286	11564	416
1961	5343	6341	1239	365	12449	500
1962	6354	7358	1521	482	13859	465
1963	7128	9098	1637	717	15124	758
1964	7760	9987	1708	805	17553	1319
1965	9267	12041	2178	1238	22036	1951